july 1957

nlgi spokesman

journal of the national lubricating grease institute

NLGI (Proposed) Lubricating Grease Production Survey
By J. W. LANE
By J. V. STARR

Storage Stability of Aircraft Greases
By H. SCHWENKER

Analyzing the Lubricating Grease Market
By A. S. RANDAK

NLGI Board of Directors

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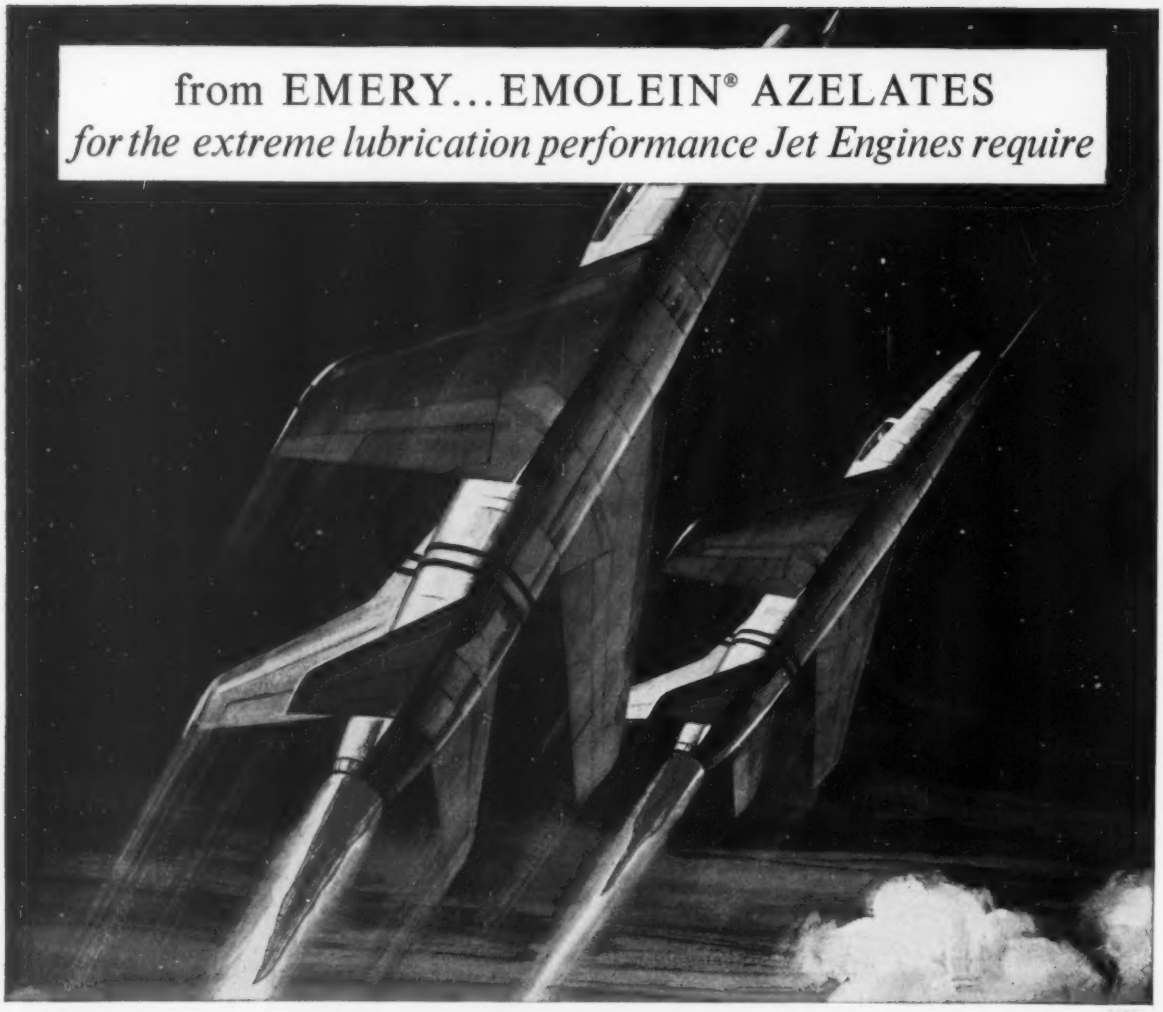

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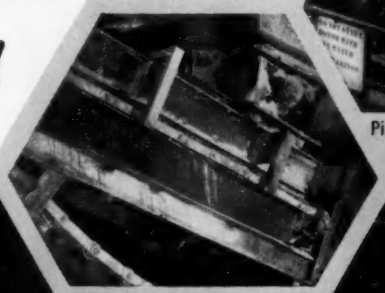
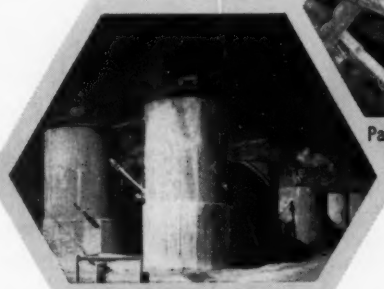


Pan Conveyor handling hot clinker (1600°F), roller bearings in dusty, moist atmosphere.



Leach tanks handling hot slurry, agitators driven by Falk gear reducing units.

V.A. Wemco classifier, part of wet grinding system, lower bearing submerged in hot sludge.

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Production Survey

THE PRESIDENT'S PAGE

By J. W. LANE
NLGI
President

For some time, sentiment has been developing within NLGI in support of a survey of recent domestic grease manufacture, the exact period not yet being determined.

I view this proposal favorably, since it is a type of activity which should be an NLGI responsibility. With the complete cooperation of our membership, which includes more than 95 per cent of the industry, we can secure accurate, factual data of just what this country makes in lubricating greases by types and volumes of each. The information on completion would be released to the membership, the petroleum industry, governmental agencies, and the public. I am sure this industry wide data would have many advantages, not only to the individual manufacturers of lubricating greases, but also to the suppliers of ingredients and product containers. There is even the possibility that a successful initial survey could eventually be broadened in scope and content until the service rendered becomes far more than can be envisioned at this time.

While no decision has been reached definitely to institute such a survey, and while all the many details involved would have to be worked out, I am pleased to report to the membership that your Board of Directors has already established two guiding principles which seem highly desirable in a project of this kind. These concern the scope of the proposed survey and the precautions necessary to properly respect the confidential nature of the individual member's contribution.

Regarding the first, after a great deal of study the NLGI Technical Committee has recommended to the Board that only production figures be considered. This type of statistic is more accurate than sales figures which, depending on any non-manufacturing marketers involved, could be reported two or more times and would therefore be misleading. For the greatest usefulness to the greatest number of members, it is believed that seven general term groupings would be desirable for thickened lubricants, as follows:

Thickener*

Aluminum Soap	Lithium Soap
Barium Soap	Sodium Soap
Calcium Soap	Other Soap

Non-Soap (Inorganic Thickeners)

With respect to the second, which in many ways is the most important principle, it has been decided that no one connected in any way with NLGI will have access to individual data. While NLGI will devise the required questionnaire, set up the machinery for organizing the survey, and release the final report, all members' replies containing survey data will be sent to an outside disinterested party for compilation and blending into a report covering the industry as a whole. Further, the individual data will be supplied anonymously, and will be destroyed immediately after compilation. Several national accounting firms specializing in performing similar services for other groups have already outlined their procedures to us and these are under study.

I might add that the legal departments of several member companies have approved the project in principle as long as the Institute employs an independent, outside organization and that no forecasts or predictions or price references are made. We intend fully to follow these precautions in our preliminary planning and throughout the duration of the survey should it become a reality.

My primary purpose at this time is to acquaint you just briefly about this projected activity. If it should actually materialize, I hope sincerely that you will cooperate wholeheartedly if it is within your capacity to do so.

*Grease containing two or more thickeners shall be listed under the category whose characteristics predominate.

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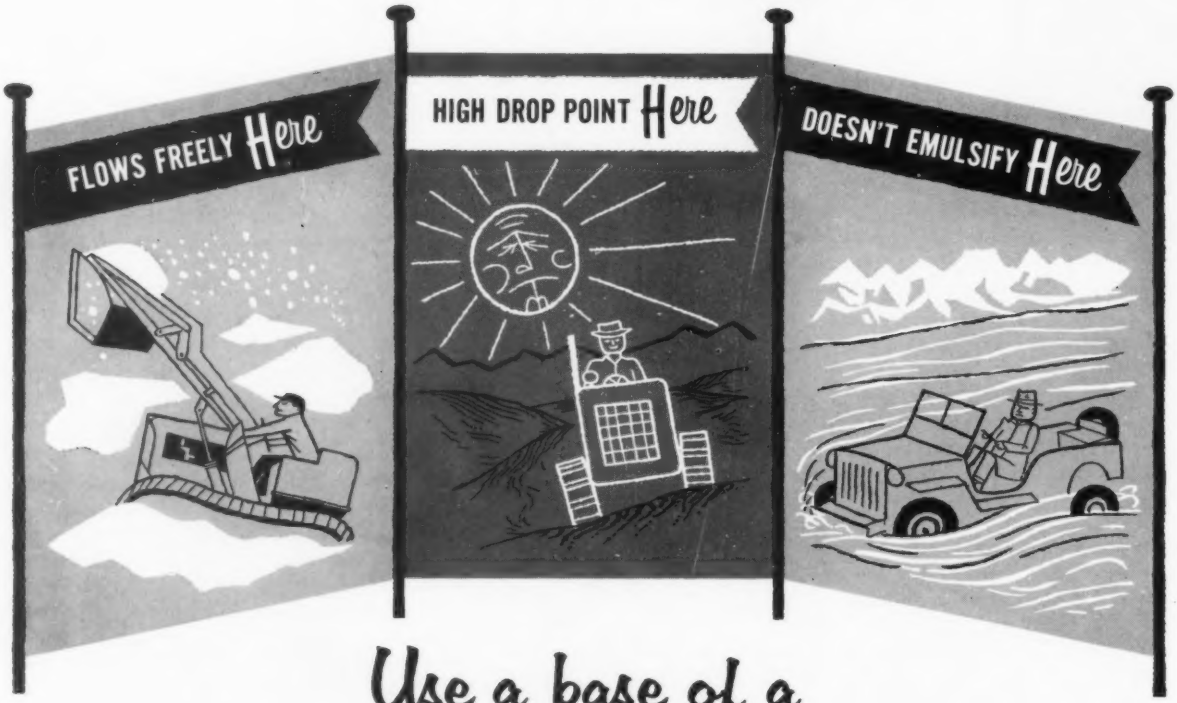

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THE COVER

Electronic computing machines may not be needed in the beginning if the proposed NLGI Lubricating Grease Production Survey becomes an actuality, but the scope and potential is such that the industry may be on the threshold of a vast new aid. The various aspects are outlined in this month's message from the president (page 5) and again in an article (page 25). National trends, which markets are growing or declining . . . there would be many uses for such data and the time may come when the survey will be important enough to warrant computers . . . who can say? To get the facts, we invite your attention and consideration to the material listed above.

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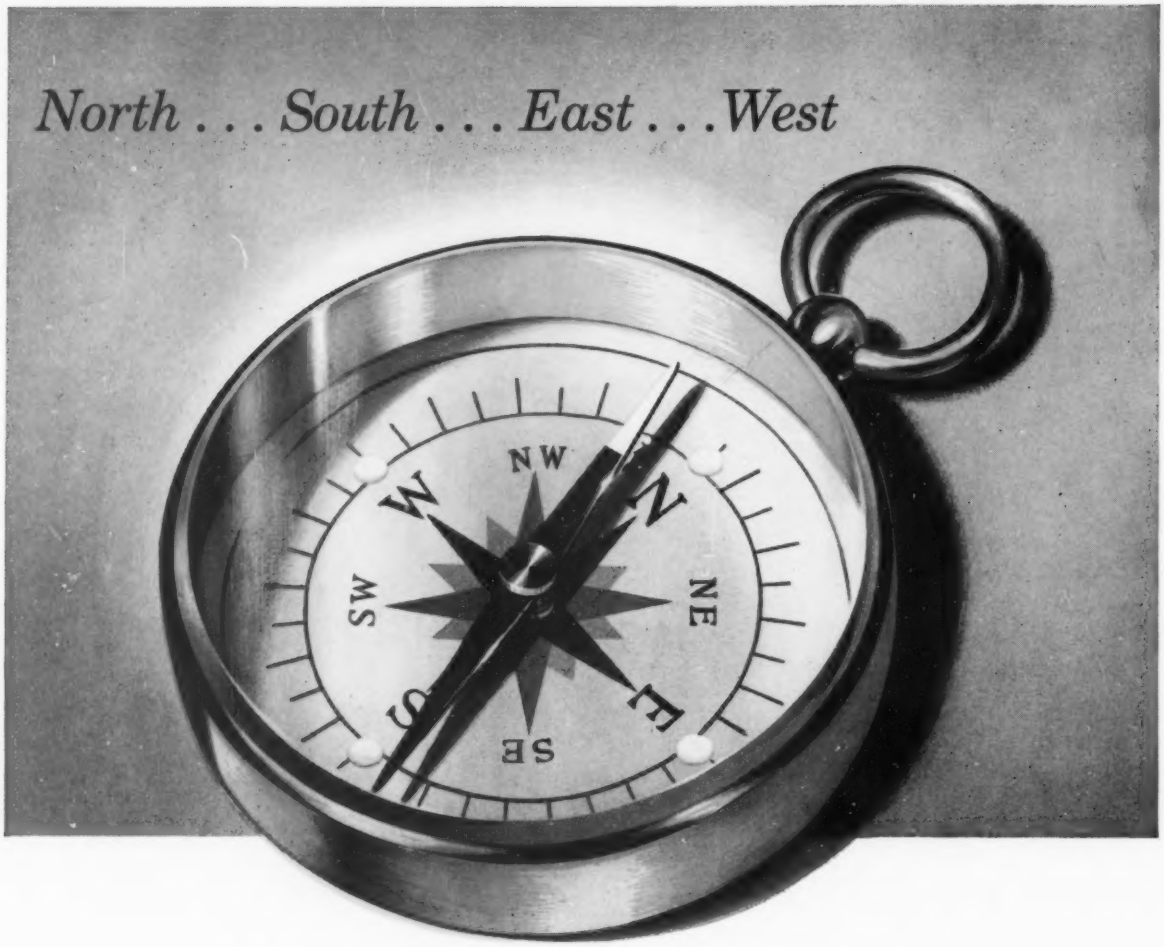

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Future Meetings

AUGUST, 1957

12-16 Society of Automotive Engineers, National West Coast Meeting, Olympic Hotel, Seattle, Wash.

18-23 National Congress of Petroleum Retailers, 11th annual session, Sheraton Gibson Hotel, Cincinnati.

SEPTEMBER, 1957

9-12 Society of Automotive Engineers, national tractor meeting and production forum, Hotel Schroeder, Milwaukee.

10-11 Petroleum Packaging Committee, Point Edward, Ontario, Canada.

11 API Division of Marketing, Lubrication Committee meeting, the Traymore Hotel, Atlantic City, N. J.

11-13 National Petroleum Association (55th annual meeting), Traymore Hotel, Atlantic City, N. J.

18-19 Ohio Petroleum Marketers Association Fall Conference and Golf Tournament, Commodore Perry Hotel and Heatherdowns Country Club, Toledo, Ohio

22-24 Independent Oil Compounders Association Tenth Annual Meeting, Carter Hotel, Cleveland, Ohio.

22-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

23-25 ASME, Fall meeting, Statler Hotel, Hartford, Conn.

26-27 Western Petroleum Refiners Assn., regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

30-Oct. 2 American Oil Chemists' Society (1957 Fall meeting), Netherland Plaza Hotel, Cincinnati.

OCTOBER, 1957

1-2 Texas Mid-Continent Oil & Gas Assn. (38th annual meeting), Texas Hotel, Fort Worth.

1-5 SAE National Aeronautic Meeting, Aircraft Production Forum, and Aircraft Engineering Display, The Ambassador, Los Angeles, Calif.

6-10 ASTM Committee D-2 meeting, Sheraton-Park Hotel, Washington, D. C.

7-9 ASME, ASLE-ASME Lubrication Conference, Royal York Hotel, Toronto, Ont.

7-11 American Institute of Electrical Engineers (1957 Fall general meeting), Morrison Hotel, Chicago.

9-12 SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis.

10-12 ASME, Fuels-AIME conference, Chateau Frontenac, Quebec City, Que.

13-16 API Division of Refining (midyear meeting), Penn-Sheraton Hotel, Philadelphia.

14-16 API Division of Marketing, Operations and Engineering Committee meeting, Biltmore Hotel, Los Angeles.

16-20 API Marketing Div. Marketing Research Committee, Camelback Inn, Phoenix.

28-30 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1957

4-6 SAE National Transportation Meeting, Hotel Statler, Cleveland, Ohio.

5-6 SAE National Diesel Engine Meeting, Hotel Statler, Cleveland, Ohio.

6-8 Society of Automotive Engineers, National Fuels and Lubricants Meeting, Hotel Statler, Cleveland, Ohio.

11-14 API 37th Annual Meeting, Conrad Hilton and Palmer House, Chicago, Ill.

DECEMBER, 1957

1-6 ASME, annual meeting, Statler Hotel, New York City

3-4 Petroleum Packaging Committee, quarterly meeting, Hotel Washington, Washington.

MARCH, 1958

4-6 SAE Passenger Car, Body and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

31-Apr. 2 SAE National Production Meeting and Forum, The Drake, Chicago, Ill.

APRIL, 1958

16-18 National Petroleum Association, Cleveland, Ohio

JUNE, 1958

8-13 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

22-28 ASTM 61st Annual Meeti Hotel Statler, Boston, Mass.

SEPTEMBER, 1958

10-12 National Petroleum Association, Atlantic City, N. J.

OCTOBER, 1958

20-22 SAE National Transportation Meeting, Lord Baltimore Hotel, Baltimore, Md.

22-24 SAE National Diesel Engine Meeting, Lord Baltimore Hotel, Baltimore, Md.

27-29 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1958

5-6 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

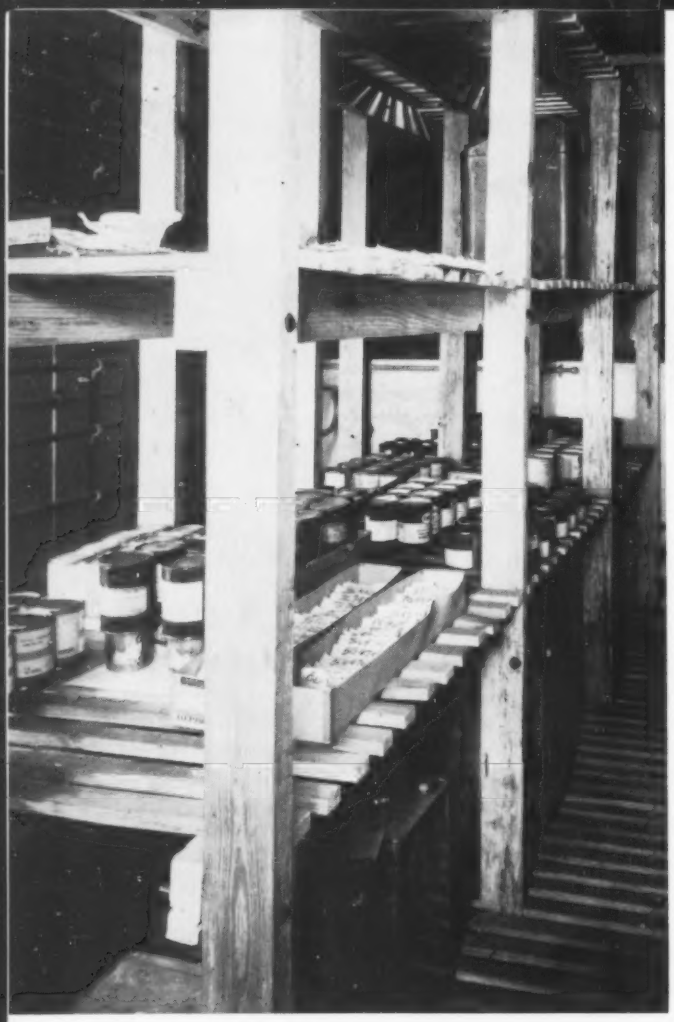
***MARCH, 1959**

3-5 SAE Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

JUNE, 1959

14-19 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

*Tentative



Storage Stability

By H. Schwenker

Wright Air Development Center

Presented at the National Lubricating Grease Institute Annual Meeting, Edgewater Beach Hotel, Chicago, '56

INTERIOR of storage room maintained at 130° F—simulated desert storage. In all cases the apparent viscosity of silicone and diester greases was higher at 130° F.

ABSTRACT

Storage stability programs have been completed under the following climatic conditions:

Simulated Desert Storage
Room Temperature Storage
Simulated Tropical Storage

The purpose of the above storage stability programs was to determine the shelf life of soap-diester, soap-petroleum, and soap-silicone greases in one-pound cans. Soap-diester greases and soap-silicone greases were also stored in packaged pre-lubricated bearings. It was also intended to check the grease characteristics which are most affected by storage.

Consistency was one of the characteristic properties of greases most affected by storage. Soap-diester greases show no substantial change in worked penetration after 30 months storage at 130°F and at room temperature or after 36 months under tropical conditions. Soap-silicone greases show a definite tendency to harden over the first 24 months of storage at 130°F, however, after 30 months at 130° F, the greases began to soften somewhat although they were still considerably harder than before storage. Soap-silicone greases stored at room temperature showed a similar tendency to harden, however, there was no resoftening of the grease after 30 months storage. Soap-petroleum oil greases show relatively little change in consistency after storage under tropical conditions. Attempts to correlate changes in consistency with changes in other physical and chemical properties of the greases during storage were made, however, no generalizations could be made regarding corresponding property changes with changes in consistency of greases during storage.

# of Aircraft Greases

THE STORAGE STABILITY of aircraft greases is of extreme importance due to the global operation of the United States Air Force. Many of the depots supplying materials such as greases and other lubricants needed by tactical or strategic aircraft are located in climatic extremes such as might be found in the tropics, antarctic or the desert. In order to provide proper maintenance and insure combat readiness of military aircraft, it is necessary to stockpile lubricants in these various depots. Greases and other lubricants must therefore be able to withstand long periods of storage under the various climatic conditions to which they may be subjected without suffering changes in their physical and chemical properties that would prevent them from meeting specification requirements.

In recognition of the importance of determining the storage life of aircraft greases, the Air Force has been conducting storage stability tests of all Air Force greases in various types of climatic conditions.

This program is designed to (1) eliminate procurement of greases that are not stable in storage thereby eliminating waste and (2) to insure that those greases that are purchased will be capable of providing satisfactory lubrication when needed.

Simulated Desert Storage

The effect of long term storage on six soap-diester greases and three silicone type greases was determined. The greases tested are identified in Table I.

To insure uniform age of all materials used in these storage programs, the test greases were specifically purchased for these tests. Fifteen pounds of each of the nine test greases, packaged in one pound cans, was placed in a room maintained at a temperature of 130°F. ±5°F. Three pounds of each of the nine test greases was stored at room temperature. Triplicate samples of each of the greases stored at 130°F. were removed at six month intervals over a period of thirty months in order to follow the progress of deterioration and to note the possible development of any critical breakdown points. Triplicate samples of each of the greases stored at room temperature were removed only after a thirty month storage period. The effect of storage on the consistency of the test greases was measured by the following tests: (a) worked penetration, (b) apparent viscosity, and (c) low temperature torque.

The diester type greases show no substantial change in worked penetration after storage for thirty months at 130°F. or at room temperature with the exception of MLG 4048 which shows a surprising drop in consistency for the twenty-four month sample at 130°F. It is felt that this result is probably in error due to excessive leakage of oil from a faulty container. The silicone greases show a definite tendency to harden over the first twenty-four months of storage at 130°F. At the end of the thirty month period, a softening of the grease was apparent. However, it is not understood why this occurred. Unfortunately, the thirty month samples were the last remaining samples in storage at 130°F. Hence, it was not possible to check further progress of the silicone greases in storage to see if the softening trend continued.

TABLE I

Code No.	*Specification*	*Soap Type*	*Oil Type*
MLG 4036	AN-G-25	Lithium stearate	Poly alkene glycol diester
MLG 4040	AN-G-25	Lithium stearate	Diester
MLG 4048	AN-G-25	Lithium 12 hydroxy-stearate	Diester
MLG 4057	MIL-G-3278	Lithium stearate	Diester petroleum
MLG 4095	MIL-G-3278	Lithium stearate	Diester
MLG 4235	MIL-G-3278	Lithium 12 hydroxy-stearate	Diester petroleum
MLG 4134	None	Lithium stearate	Methyl phenyl silicone
MLG 4133	None	Lithium stearate	Methyl phenyl silicone
MLG 4135	None	Lithium stearate	Methyl phenyl silicone

WORKED PENETRATION

(Penetrations measured in tenths of a millimeter)

Grease Used	*Initial Data*	*6 Mos. Storage @ 130°F.*	*12 Mos. Storage @ 130°F.*	*18 Mos. Storage @ 130°F.*	*24 Mos. Storage @ 130°F.*	*30 Mos. Storage @ 130°F.*	*30 Mos. Storage @ Rm.Temp.*
MLG 4036	263	266	267	259	253	262	255
MLG 4040	317	331	343	329	337	342	318
MLG 4048	274	284	289	257	221	277	278
MLG 4057	288	304	293	286	292	298	310
MLG 4095	272	265	268	252	268	267	276
MLG 4235	295	279	270	267	282	259	275
MLG 4134	321	264	234	252	227	288	285
MLG 4133	274	256	249	230	205	244	283
MLG 4135	339	340	337	321	309	323	303

Apparent Viscosity in Poises at Shear Rate 20 Seconds at −65°F.

Grease Used	*30 Months Storage at 130°F.*	*30 Months Storage at Room Temperature*
MLG 4036	5,300	3,850
MLG 4040	12,200	7,600
MLG 4048	8,800	8,150
MLG 4057	6,610	4,950
MLG 4095	8,400	8,400
MLG 4235	9,400	8,200
MLG 4134	45,000	30,000
MLG 4133	14,300	12,500
MLG 4135	Not a −65°F. grease	

Low Temperature Torque Test at −65°F.

Grease Used	Initial Data	6 Mos. Storage at 130°F.	12 Mos. Storage at 130°F.	18 Mos. Storage at 130°F.	24 Mos. Storage at 130°F.	30 Mos. Storage at 130°F.
MLG 4036	1.2	1.4	1.2	1.6	1.0	1.1
MLG 4040	1.0	3.2	1.8	3.2	1.0	3.1
MLG 4048	1.0	1.1	1.1	1.4	1.0	2.3
MLG 4057	1.0	1.0	1.0	2.9	1.1	1.2
MLG 4095	1.0	1.0	1.0	1.0	1.0	2.6
MLG 4134	—	1.0	1.0	1.0	1.0	1.0
MLG 4133	—	1.0	1.0	1.0	1.0	1.0
MLG 4235	1.0	1.3	1.0	1.0	1.0	1.0
MLG 4135*	—	—	2.5	17.5	6.1	—

Note: Test run in accordance with MIL-G-3278. All data supplied is the average of two runs and constitutes the number of seconds required to make one revolution of the torque test.

* Test conducted at −40°F.

Changes in consistency of the greases in storage were more evident upon determination of their apparent viscosities. In all cases the apparent viscosity of both silicone and diester greases was higher for those samples stored at 130°F. than those stored at room temperature. The hardening of the silicone greases during storage is again evident from their higher apparent viscosities. The diester greases all have apparent viscosities which are within their specification limits.

Greases, packed in 204 Conrad type bearings and sealed in moisture-vapor proof containers, were placed in storage at 130°F. at the same time as the one pound cans of greases. These greases were from the same batches. Low temperature torque tests at −65°F. show no appreciable change in either the silicone or diester greases.

Simulated Tropical Storage

The following greases were placed in tropical storage in one pound cans:

Code No.	*Specification*	*Oil Type*	*Soap Thickener*
MLG 6657	MIL-L-7711	Petroleum	Sodium stearate
MLG 6651	MIL-G-3278	Diester	Lithium stearate
MLG 6659	MIL-L-3545	Petroleum	Sodium stearate
MLG 6660	MIL-L-3545	Petroleum	Sodium stearate

Simulated tropical conditions in the storage room were as follows:

The humidity in the room was maintained at 95% while the temperature was constant at 85°F. Samples were withdrawn from storage at yearly intervals over a three year period.

There were no appreciable changes in the consistency of any of the test greases based upon their worked penetrations over the three year storage period.

Low temperature torque tests and apparent viscosity determinations revealed no appreciable change in the consistency of MLG 6651 soap-diester grease after being stored for thirty-six months under simulated tropical storage conditions.

Consistency of soap-diester greases was relatively

Worked Penetrations

Grease	Initial Data	12 Mos. Trop. Storage	24 Mos. Trop. Storage	36 Mos. Trop. Storage
MLG 6659	346	348	344	348
MLG 6660	318	312	310	314
MLG 6657	281	284	282	271
MLG 6651	290	296	301	290

Apparent Viscosity of MLG 6651 In Poises at –65°F.

	Initial	12 Mos. Trop. Storage	24 Mos. Trop. Storage	36 Mos. Trop. Storage
at 20^{-1} sec.	9400	7800	7500	7850
at 50^{-1} sec.	5130	4370	4100	4500

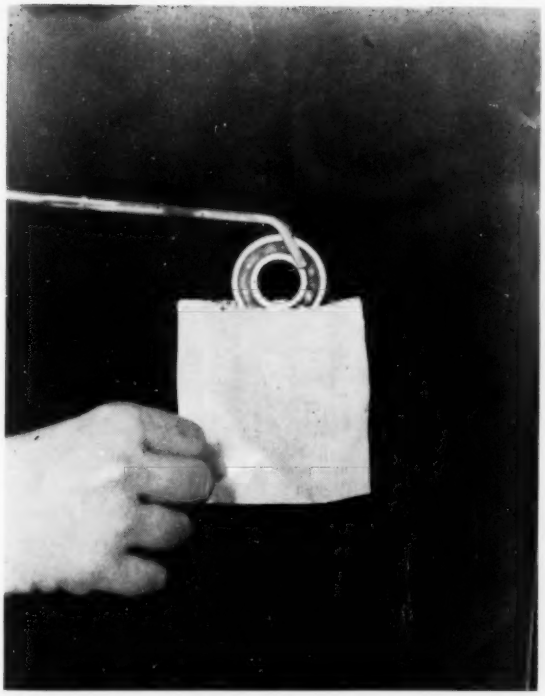
Low Temperature Torque of MLG 6651 (–65°F.)

Initial	12 Mos. Trop. Storage	24 Mos. Trop. Storage	36 Mos. Trop. Storage
1 sec.	—	—	2 sec.

unaffected by long periods of storage when subjected to room temperature, elevated temperature or by high humidity conditions. It should be noted, however, that in all of the storage tests, i. e., tropical storage room temperature, and simulated desert storage, the temperature remained constant. This is emphasized because there are some indications that cycling of test temperatures (such as occur in actual desert storage) exhibits a more pronounced effect upon the consistency of greases in storage.

Consistency of soap-silicone greases changed considerably when stored at room temperature and at 130°F. under simulated desert storage. There was a considerable hardening of the soap-silicone greases over the first twenty-four month period followed by a period of softening over the next six months. However, an insufficient amount of sample remaining prevented further study of the consistency reversion.

Soap-petroleum oil greases exhibited no appreciable change in consistency when stored over a thirty-six month period under tropical storage conditions.



GREASE packed bearing is being placed in a moisture vapor barrier prior to heat sealing for storage at 130° F.

Attempts to correlate changes in consistency with changes in other physical and chemical properties of the greases during storage were made. However, no generalization could be made regarding corresponding property changes with changes in consistency of greases during storage.

Use of the low temperature torque tests as outlined in MIL-G-3278 was of little or no value in indicating consistency changes of the greases due to storage. Two possible reasons for this are (1) channeling of the grease and (2) the poor sensitivity of this particular test. The low temperature torque test showed no difference in the torque values obtained before or after

Continued on page 14

About the Author

HERBERT SCHWENKER *is senior project engineer of Wright Air Development Center in the lubricants section of the materials laboratory. He is responsible for research and development leading to new or improved aircraft greases, for qualification testing of engine oils, hydraulic fluids and other related materials, and for the development of high temperature physical and chemical tests for lubricants and fluids. Schwenker graduated with a B.S. degree from Xavier University in Ohio.*

simulated desert storage although it was clearly evident that these greases had hardened over fifty points based upon their worked penetrations.

The estimated storage stability life of the various specification and non-specification greases tested under simulated desert storage, room temperature, and tropical storage are given below:

Room Temperature and Simulated Desert Storage

MIL-G-3278 Greases—36 months in one pound cans, 24 months in packaged prelubricated bearings.

Soap-Silicone Greases—6 months or less in one pound cans at 130°F., 12-18 months at room temperature in one pound cans.

Simulated Tropical Storage

MIL-G-3278 Greases—36 months in one pound cans.

MIL-L-3545 Greases—36 months in one pound cans.

MIL-L-7711 Greases—36 months in one pound cans. ■

NLGI ANNUAL MEETING

Make Your Reservation At the Edgewater Beach • Chicago • October 28-30

ANALYZING
the Lubricating Grease Market

By A. S. RANDAK, Sinclair Refining Company

Presented at the National Lubricating Grease Institute Annual Meeting, Edgewater Beach Hotel, Chicago, '56

I HAVE BEEN requested to speak on "Analyzing the Lubricating Grease Market" or perhaps I should say that indirectly I asked for this honor. Since my experience on how to manage to get yourself selected to deliver a paper before the NLGI may be of interest to budding authors or speakers, I have attached as Exhibit 1 my letter of November 14, 1955, addressed to our President W. M. Murray, suggesting subjects for papers to be presented at the annual meeting. The important factor in this process is to be sure to say that you do not have the time to prepare such a paper yourself and, therefore, regret you are not available for the purpose (just in case the program chairman might entertain such thoughts). It's always much more exciting to be drafted, you know—rather than follow the volunteer route. I'm confident that many of our members and guests present at this meeting have served a tour of duty in military service at one time in their careers and quickly learned that paramount above all other actions—never volunteer! In all seriousness, however, I hope you will each take time to read my letter as it discusses aspects of a common problem with which we should all be concerned.

Now to get on with the subject at hand, "Analyzing the Lubricating Grease Market." One of the first things we did in starting to compile data was to write our many friends and associates in the consumer industrial organizations and solicit their suggestions on new uses and applications for lubricating grease. I should like to thank all who replied to my letter for their frank and enlightening comments. Gentlemen, not one respondent indicated a new application or new market for grease products. Several replies did express a need for improved type greases but these were for existing applications. Perhaps an accurate reflection of the general trend were a number of comments that effort was being expended toward eliminating use of grease through improved developments in self-lubricating materials and replacing grease with oil. There is food for serious thought and concerted action by the grease industry on the development of new markets for our products. In my humble opinion, this is one of

PRACTICALLY all reputable grease marketers provide "prescription products" in very small quantities as a service to select customers, even though the project could not be justified on the basis of an economic evaluation.

the greatest challenges facing lubricating grease marketing people today.

It is our responsibility to spur on the development of new and improved grease products and after development, we must insure their satisfactory performance, successful promotion, and proper application in order to obtain industry-wide acceptance. Development of new and improved grease products follows two general patterns; *First*, through the consistent effort of our industry research and development laboratories to furnish new and better products that will not only benefit the consumer with substantially improved performance, but will also be economically profitable to the marketer. The *second* pattern of development is based on a direct consumer requirement or demand for a product which will meet a particular need. This need is investigated and nurtured by the technical sales organization which initiates recommendations for development to research or the manufacturing organization, depending on the requirements in each case. Assuming that primary technical consideration on desired performance qualities and other special applications requirements have been satisfactorily resolved, then the evolution process involves determining answers to questions in *two* separate areas. These are: First, market appraisal and, second, development requirements.

TABLE NO. 1 lists questions to be answered in making a market appraisal.

TABLE NO. 2 lists questions pertinent to development requirements.

These lists are by no means complete and will vary with each laboratory and marfeting organization. However, they do indicate that it is necessary to follow a logical and orderly procedure before a decision can be made to undertake the development of a new grease product. Rising development, manufacturing, supply and distribution costs make it mandatory to assure that the development and introduction of a new product can be economically justified. There are, of course, exceptions. I have reference to the specialty "prescription" type of product which may be required by a good customer in very small quantities. Practically all reputable grease marketers provide such "prescription products" as a service to select customers, even though the project could not be justified on the basis of an economic evaluation.

After answers to all questions have been developed, the data is consolidated and a summary review is made by the technical sales group. If all factors considered are favorable, technical sales recommends, through proper channels, that the laboratory activate a project to develop the new product. The development fol-

TABLE NO. 1

Market Appraisal

1. What application (multi-use) and industries will the new grease product cover?
2. What is the potential market and sales volume projected through a 5-year period?
3. Will it have multiple applications that simplify the customer's lubrication requirements such as reducing grease inventory, reducing frequency of lubrication, improved storage stability and finally does the new product offer customers savings by improving over-all performance and effecting a reduction in maintenance and labor costs?
4. What grease schedule simplification benefits can the marketer derive?
5. What volume of present grease sales can be diverted to the new product?
6. Does it have new sales features—and can the improved qualities be demonstrated visually and simply?
7. What performance benefits are readily adaptable to promotion—what should be the preliminary requirements for promotional pamphlets and literature?
8. How shall it be introduced—under a new brand name or as a replacement for an existing brand?
9. What should be the tentative introductory and followup advertising coverage?

TABLE NO. 2

Development Requirements

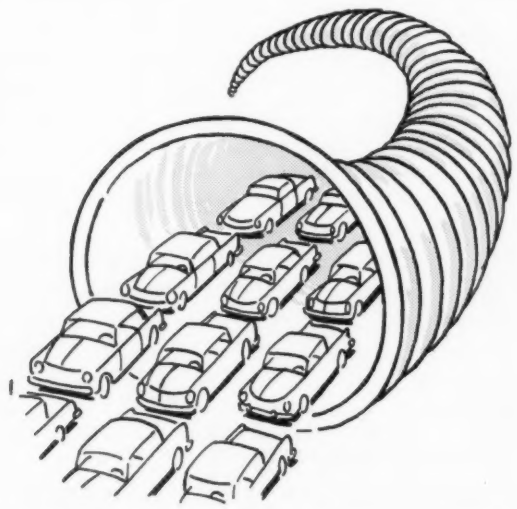
1. What preliminary research is necessary?
2. How much time will be required?
3. What costs are involved?
4. Are there patent complications?
5. Can patent protection be secured?
6. Will laboratory tests and limited commercial field service tests successfully insure large scale performance?
7. Can the product be produced in existing manufacturing facilities?
8. Will its manufacture interfere with present barrel house operations?
9. When will the new product be available for commercial production?

lows a normal cycle with technical sales, manufacturing and research all cooperating as a team. The field service evaluation might require some modification in the formulation before a final formula is established. By this time, all other questions on properties such as high temperature resistance, anti-rust, oxidation stability, color, chemical stability, blending stability, extreme pressure, corrosion resistance, oiliness, tackiness, anti-wear and low temperature torque should have been adequately proven in service performance.

If we are satisfied that the new grease has met all requirements, we know we have a product which will meet the customer's need and find a ready market—providing the price is commensurate with the benefits to the consumer. We are now ready to prepare our sales program.

These introductory comments are somewhat diversionary from the topic which I have been assigned on analyzing the lubricating grease market but are an essential procedure before any serious consideration can be given to the introduction of a new product into a continually changing market.

In my opening comments, I implied a general lack of concentration by our industry on creating new markets. Perhaps it is difficult for us to become too concerned over the fact that we are slowly but steadily losing existing markets when the demand within many of the present large volume markets is projected to show substantial increases during the next 10-year period. It's easy to overlook or ignore the general trend that annual grease consumption per unit of equipment or per motor vehicle has been on the decline during the postwar years, since the rapidly increasing machine and vehicle population have and will continue to far more than offset this trend in terms of over-all sales demand. Chek-Chart Market Potential Reports aptly highlight this trend within the automotive industry with interesting figures.



IT is difficult for us to become too concerned over decreasing markets when projected volume in present large markets shows a substantial increase during the next ten year period. Grease consumption per unit is on a decline.

The next table, No. 3, shows quite clearly the excellent strength and health of the grease market projected through the next five and ten year period. Table No. 4 shows the estimated increase in grease demand for passenger cars. Exhibit 2 gives the basis and source for the increase in demand for each industry listed in the slide. All in all, we might ask ourselves whether the industry has the capacity to manufacture the volume of grease that will be required in 1965.

TABLE NO. 3

Estimated Grease Consumption

Millions of Pounds Projected to 1960 and 1965

	1955	1960	% Inc.	1965	% Inc.
Coal Mining (Bituminous)	39.5	50.5	27.8	71.0	79.6
Textile Industry	14.5	15.7	9.0	16.2	12.0
Construction (All Types)	112.8	134.3	19.0	154.6	37.0
Farming	105.5	116.0	10.0	132.0	25.1
Chemical Industry	32.7	39.2	20.0	44.1	35.0
Metal Working Industry	71.9	81.2	13.0	93.4	29.9
Food Industry (Pkg.& Mfg.)	41.3	51.6	24.9	60.9	47.5
Transportation (Including School Bus)	1.1	1.4	25.0	1.7	50.0
Trucking Industry	172.0	209.0	22.5	255.0	48.5
Passenger cars	351.0	450.8	28.4	598.5	67.7
Totals	942.2	1,140.0	21.0	1,427.0	51.5
Increase		198 Million Lbs.		485 Million Lbs.	

TABLE NO. 4

Estimated Grease Consumption

Passenger Cars Projected to 1960 and 1965

	1955	1960	1965
Number of Units	50,300,000	65,250,000	78,320,000
Chassis Lubrication Jobs and Miscellaneous	315,079,200	405,149,171	545,772,907
Repacked Front Wheel Bearings	35,008,800	45,526,400	52,504,400
Automatic Systems (Multilubers)	12,000	185,719	278,359
Total, Pounds	351,000,000	450,861,290	598,555,666

Summary

Based on all available data, conservative estimates indicate that grease consumption in the industries listed will by 1960 increase 21% over 1955 and by 1965, will increase 50% over 1955. We were unable to develop estimates for consumption in other industries which have not been listed such as: *Railroads*, *Steel Mills* and *Quarrying*. Statistics for these industries are just not available. It is a well-known fact that both

the steel and railroad industries consume large volumes of lubricating greases and, therefore, we believe that the figure which we have developed can be considered on the conservative side.

Conclusion

In conclusion, I must admit it is difficult to worry about the cry of "*Wolf*" when the sun is shining, the larder is full, and we are all moving forward in a strong, healthy, and progressive economy. Nevertheless, let us not be completely blinded by the very rosy prospects which lie ahead and keep in mind that there are any number of material developments now in process which could have an adverse effect on the realization of the grease estimates which we have projected. Emphasis is being placed by designers to develop self-lubricating or non-petroleum lubricant requiring materials, such as Teflon, and others of a synthetic nature. More recently, an announcement which I am certain you will find of strong interest covered the results of work done on using oil-soaked felt pads in the lubrication of ball bearings at high speeds and high temperatures. Tests conducted at 10,000 rpm at a temperature of 325° ran in the range of 1000 to 1800 hours before failure on felt pads saturated with a synthetic type lubricating oil. Since this compares with an average of approximately 550 hours before failure on the same test with grease packed bearings using a high quality lubricating grease, the implications need no elaboration.

In Exhibit No. 2, where the basis for grease consumption estimates has been spelled out, I reported that the average number of chassis grease fittings have been reduced 35% since 1950. Since this data has been compiled, this trend has been accelerated. Within the past few weeks, information on the 1957 model requirements has been released. The average number of chassis lube points on the 1957 cars will be 9.04 as compared with the 1956 model average of 15.6 or a reduction of 42%. Combining the previous 35% reduction figure with the 42% gives a reduction of 77% in the average number of chassis grease fittings which have been removed from passenger cars since 1950. This rather drastic reduction in the 1957 cars over the 1956 models is certainly symbolic of the car manufacturers' trend to completely eliminate field lubrication service through improvements in design wherever possible.

We shall all be fully occupied with the tremendous growth in the market demand for grease products in the 1960-1965 period. I am confident the lubricating grease industry will be prepared to supply this demand with products of improved and higher quality. However, let me ask that we do not completely overlook the present reverse trend and give some thought to creating new markets which we need now—not some day in the distant future.

Last, I should like to express my appreciation to Mr. G. T. O'Brien, my assistant, who devoted considerable time and effort to compiling and consolidating the data with the many organizations involved. To my knowledge, this represents the first attempt in publishing present and projected grease consumption broken down on an industry basis.

Exhibit No. 1

Mr. William M. Murray . November 14, 1955
Deep Rock Oil Corporation
308 N. Robinson
Oklahoma City, Okla.

Dear Bill:

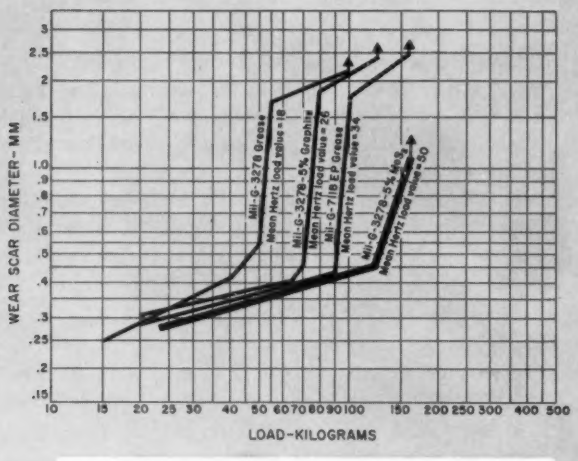
I regret I was unable to remain for the Technical Committee session last Wednesday morning as, aside from the regular sub-committee reports, I understand that a discussion on marketing problems of grease was precipitated and that the subject will be referred to the Board for further action.

The problems and trends in grease marketing we are now witnessing is a matter of vital concern to the entire industry. At Sinclair, we have given considerable thought and attention to developing a constructive and aggressive promotional program, and I should like to see a development in the form of a united industry endeavor. In our opinion, too little attention has been devoted by the NLGI to the marketing aspects of the industry's operations and conversely too much stress seems to have been placed on the purely technological developments. Far be it from me to suggest that the technical and scientific should be played down or ignored but unless we start giving some attention toward investigating and developing marketing centered papers and articles, I am afraid that ultimately we shall find the NLGI will become an excellent technical reference source on a product which will be in diminishing demand.

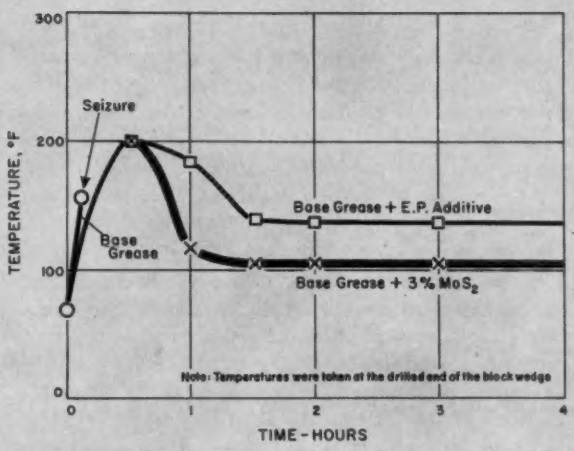
During the past years, the NLGI have ably presented information on grease under a multitude of technical topics including:

Structure
Composition
Manufacture
General and Specialized Application Performance
Selection of Grease Type
Pumpability
Dispensing Equipment Performance

and many others. More recently, the industry is becoming increasingly concerned with a general industrial trend to replace grease lubrication with oil and


WEAR SCAR DIAMETER - MM
LOAD - KILOGRAMS
Mil-G-3278 Grease
Mean Hertz load value = 18
Mil-G-3278 - 5% Graphite
Mean Hertz load value = 26
Mil-G-7118 E.P. Grease
Mean Hertz load value = 34
Mil-G-3278-5% MoS2
Mean Hertz load value = 50

4-ball E.P. test shows the superior extreme pressure properties of MoS_2 grease over the same grease without additives. In the same test, grease containing 5% graphite had a mean Hertz load value of 26; the conventional E.P. grease Hertz value was 34.


TEMPERATURE, °F
TIME - HOURS
Seizure
Base Grease + E.P. Additive
Base Grease
Base Grease + 3% MoS2
Note: Temperatures were taken at the drilled end of the block wedge

Timken endurance test clearly shows how MoS_2 functions when added to a base grease. With base grease alone, the specimen seized in about 10 minutes. With MoS_2 added, lubrication was effectively sustained throughout the test at a reduced temperature of about 100°, compared with a temperature of about 130° for the conventional E.P. grease.

Moly-Sulfide additive extends effective lubrication

Laboratory and field tests prove that chassis lubricants containing MoS_2 sustain lubrication after base grease is wiped off

When standard chassis greases are first applied to shackle pins, ball points and other bearing points under trucks, trailers and passenger cars, excellent results are obtained. These greases, however, are subject to mechanical motion, such as reciprocation, pressure, oscillation and shock loading which tend to eject the lubricant.

At this point, chassis grease containing 3% Moly-Sulfide proves its great value. MoS_2 is forced between the rubbing surfaces, adheres to the metal and forms a protective film that prevents galling, welding and fretting. The extent to which MoS_2 sustains lubrication is demonstrated by substantial reduction in wear.

Four tests show how MoS_2 reduces wear

1. **Shell 4-ball extreme pressure test** (see illustration) —MoS_2 addition reduces wear more than 50%, increases load capacity about 70% over base grease.

2. **Falex 2-hour wear test**—As the chart here shows, MoS_2 sustains lubrication, as proved by a reduction in wear, by an average factor of 500.

Grease	Loss in weight of specimen
Lithium-base	1,000 mg.
Lithium-base plus 2% MoS_2	1.98 mg.—average of 3 runs

3. **Timken endurance test** (see illustration)—MoS_2 sustains lubrication well beyond the capabilities of the base grease alone, and at a lower temperature than conventional E.P. grease.

4. **Simulated shackle bolt service test**—oscillating friction machine—3% MoS_2 addition virtually doubles the effective lubrication of a lithium base chassis grease —is far more effective than conventional additions.

Hours to failure—average of 2 tests

Additive	None	3% MoS_2	5% ZnO	15% ZnO
Dry	350	564	336	555
Wet	162	264	109	85

On-the-road use proves MoS_2 prevents chassis wear

A St. Louis company reports no noticeable wear on chassis parts of auto transport trailers, since they selected an MoS_2 chassis grease.

Based on their own tests, several major automobile and truck manufacturers use—and recommend—MoS_2 grease for torsion suspension units, ball joint suspension, as well as for many other critical-wear areas.

Moly-Sulfide greases are available from many producers today. For a list of the manufacturers of these greases—which includes several major oil companies—and for a copy of "Molybdenum Disulfide as a Grease Additive," write to Department 58, *Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y.*

also the trend by machine and equipment manufacturers to reduce the number of points requiring grease lubrication service. I believe we all read with close interest the article in one of the recent issues of the *National Petroleum News entitled* "Growing Today—But Tomorrow?" which dealt with the trend toward reducing grease lubrication service and consumption by the passenger car manufacturers.

The controversial aspects of the car manufacturers' attitude on product quality as a contributing factor have been well discussed and argued. Hugh Hemingway also reviewed one facet of the subject in his excellent welcome address on Monday, October 31st. I don't believe I need dwell to any great length on how vitally concerned we all are in future developments on grease utilization. Therefore, it goes without saying that we should be on the alert to protect and advance the position which grease has established in providing outstanding lubrication. Before we can plan any intelligent approach to a united effort, we must and should have information which is not presently available and I should like to propose that the NLGI appoint a committee to study "trends in grease manufacturing and sales." Since none of us are keen about divulging information on our individual companies progress in grease sales, the committee should select some neutral outside agency to receive, collate, and tabulate information from a questionnaire which would be distributed to the entire NLGI Manufacturing and Marketing membership. The committee should develop the questions to be asked on the questionnaire which would cover sales data information over the past 5-year period. Manufacture and sales data by grease types—such as calcium soap, sodium soap, lithium or other types and whether for automotive, aircraft or industrial markets would be helpful to each of us in projecting future planning.

I should like to emphasize that under no circumstances should any individual or company member of the NLGI have access to the completed questionnaire—they would be retained by the survey agency on a confidential basis and only the consolidated data would be distributed. No individual company's contribution would be identified or made available.

My second suggestion concerns the difference of opinion among NLGI members on how to best counteract the trend toward reducing grease lubrication points on both automotive and industrial equipment. There is one group that believes the equipment manufacturers are being unfair to lubricant manufacturers and marketers, and urge designers and engineers to return to the use of grease fittings where they have been eliminated. Let's be realistic—we can argue the subject until we're "blue in the face" without any retarding effect on a trend toward continued progress. In spite of all protests to the contrary, I seriously question the sincerity and wisdom of the proponents of the "status quo" or "the good old days." How many of us would be content to drive a twenty-five year old model car, with its attendant engine, tire and other common aggravating service problems. The same applies to household appliances such as the refrigerator, radio, record player, etc.

We have always been a progressive and constructive industry—we should not divert our thoughts and efforts from one of continuing advancement to fighting rearguard or delaying tactics to impede progress.

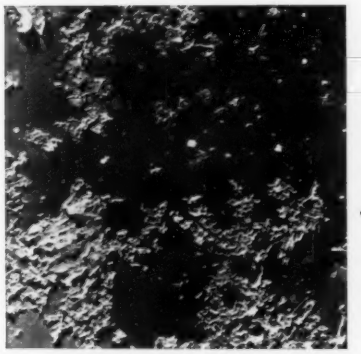
If any of us were equipment manufacturers, I am confident that we would attempt to design our product to operate and perform efficiently in use by customers with *no* or at least a minimum of field service. Let's not kid ourselves otherwise!

What we need is a new outlook—a new concept in grease marketing. Instead of continually shedding tears over markets which are likely to be lost through continued progress in design and performance, let's give some thought and attention to other existing or entirely new markets not yet exploited. Although I know that there will be some disagreement to this reflection, I should like to say that in the automotive industry, we have received a free ride! We haven't come out with any hard hitting promotion and sales program to account for the continued increase in grease consumption and grease sales from which we have all benefited. It has been the car manufacturer who has sold the public on the thrill, pleasure and necessity of car ownership—the prestige of a two car family and other feature themes that have accounted for the unprecedented and record car sales over the past years. Of course, we have had to give the automotive people the quality required in petroleum products to effect a continuing improvement in vehicle performance—but I still maintain we haven't, as an industry, promoted the use of our products in new markets! Most oil company advertising and sales promotion seems primarily concerned with newer and bigger and better claims for their products—we are no exception. The objective seems to be to attract customers from patronizing our competitors' service stations. In the long run or on an over-all scoresheet, I wonder if the record doesn't balance out!

Well, it's not too difficult to sit back and be critical—but what can we as members of the NLGI do or what might we do to continue to promote and expand the use of lubricating grease?

Well, a study group or committee might be appointed to investigate the over-all grease market. A starting point would be a "recap of information al-

LITHIUM Base Grease:



1μ

Micrograph showing soap structure of lithium base lubricating grease made from 12-hydroxy stearic acid. Courtesy of Sinclair Research Laboratories, Inc.

ITS MULTI-Properties MAKE IT MULTI-Purpose

IN CHARACTERISTICS

- Non-corrosive
- Water resistant
- High heat resistance
- Rheological properties
- Eliminates abnormal wear
- Soap oxidation stability
- Cold operating properties
- Oxidation and shear stability
- Mechanically and chemically stable

IN APPLICATION

- Prepacking anti-friction bearings
- Lubrication of plain and anti-friction rotating bearings
- Lubrication of vehicle chassis points, wheel bearings, universal joints and water pump
- Lubrication of high-temperature ball bearings
- Aircraft, artillery, instrument and general ordnance maintenance

IN MARKETING

- Lower inventory
- Less dispensing equipment
- No chance for misapplication
- Reduction in lubricating time
- One grease lubricates a vehicle

IN INDUSTRY

- Ordnance
- Manufacturing
- Farm equipment
- Transportation
- Industrial maintenance

TEN YEARS PRODUCTION EXPERIENCE AT YOUR DISPOSAL

Lithium Corporation enjoys an established acceptance among grease makers—and for "multi-reasons" too: production experience, unsurpassed facilities, available inventory and immediate shipment—all combine to assure a reliable source of consistently uniform $LiOH\text{-}H_2O$. Since we are equally interested in developing better lithium products, why not get in touch with us on your lithium hydroxide problems? A card or letter will bring immediate response.

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PLANTS: St. Louis Park, Minnesota • Bessemer City, N. C.
RESEARCH LABORATORY: St. Louis Park, Minnesota

ready available from NLGI files and *Spokesman* articles to establish:

1. In what applications can grease be established as a preferred type lubricant?
2. What manner of improvement in performance over other type lubricants can be attained?
3. What are other important benefits to the user? (We have developed 14 reasons where grease serves as a preferred lubricant which we use in our training program.)

These are just a few factors that come to mind. I'm confident there are others equally important. After the data has been developed, the committee might review how it can best be utilized with equipment manufacturers toward improving performance of existing designs or adapted to new equipment in the design stage. The promotion should be on an industry wide basis similar to that being effectively used by the Leather Industry–Carpet Industry–Cement Industry–Gas Industry–and others whose promotional effort is on a united front basis. I sincerely believe that the marketing managements of our resepective companies would be receptive to any fresh, inspiring and thought provoking approach to establish or exploit new markets for our products.

Let's broaden our approach and appraisal of the problem–rather than continue bickering over a bone on which the meat is slowly being eaten away, let's go after new game and fresh meat.

When I started this letter, I had intended to be brief–now I'm aghast at the length of this missive. Since it is a policy of long standing in my department's handling of correspondence to limit all letters to one page whenever and wherever possible, this over-run is an indication of my strong feelings on the subject.

Sincerely,
A. S. Randak

Exhibit No. 2–Basis for Grease Consumption Estimates 1955 Through 1965

Coal Industry

The grease consumption figures shown for New King Coal were gathered from rated tonnage records estimates and back orders available to the Bureau of Mines. McGraw-Hill checked these figures for projected accuracy against the U. S. Department of Commerce Lubricating Oil and Grease Survey of 1951. The Bureau of Mines in 1955 posed a rate of .083 lbs. of grease per ton of coal mined.

The sharp upward trend in the demand for power will continue beyond 395 million KW in 1965, of which Hydro Electric will furnish 70 million KW; Nuclear plants will handle 40 million KW; leaving a gap of 285 million KW to be filled by the fossil fuels, with coal as the energy source for 65% of this requirement. This means that coal production will increase in excess of 7.5% per year, with total production in 1965 of slightly less than 1 billion tons.

Textile Industry

In their determined effort to combat the flood of Japanese and Italian imports, this industry is increasing improvement and mill modernization funds by 25% per year to 1960 and expect to derive an over-all 9% to 12% gain over the next 5 years.

Construction (All Types)

Estimates for increased grease consumption in this industry are based on over-all contract awards, backlog, Governmental appropriations as published by Department of Commerce, and in *Construction Daily*, *Engineering News Record*, *Construction Method & Equipment Forecasts*. It is recorded that 1960 will show an increase of 19% in contract awards and job starts, with the ever increasing backlog building up to a figure of 116.6 billion dollars of proposed, but not awarded contracts in 1965. This includes the new governmental highway appropriation of 33.4 billion. A posed figure of 0.75 lbs. of grease per 1,000 dollars in construction project starts was used to arrive at total grease poundage.

Farm Industry

The farm industry grease consumption figure was developed through Department of Agriculture figures on total farm machine and mechanical implements in use. The data was reconciled with Farm Machinery Builders figures. The Department of Agriculture was also consulted on the trend of consolidation of smaller farms into large mechanical installations to determine the adequate farm production to fit the need of our increasing population. The very conservative figure of ¼ lb. of grease, a week, per piece of farm machinery (over-all) was used to arrive at total pounds annually.

Chemical Industry

This data was taken from recorded figures supplied by *Chemical Processing Magazine*, which rates the consumption of grease at approximately 9.5% of the total industrial consumption. We have used a lower figure of 8%. This industry has conservatively predicted an increase of 20% by 1960 and 35% by 1965.

Metal Working Industry

Figures shown here are based on the 1954 estimated grease consumption survey conducted by McGraw-

Hill Research. This total was reconciled against planned orders being placed by 1,574 companies, amounting to $656 million of production equipment. Automation in some form has been adopted by one of every five of our leading metal working shops. The authority for these statements is the Council for

WE shall all be occupied with the tremendous growth for grease products in 1960-65—but with emphasis on self-lubricating or non-petroleum requiring materials — we must create new markets now to be ready for the future.

Technological Advancement and *American Machinist*. The index points to approximately 13% increase by 1960 and approximately 30% increase in grease consumption by 1965.

Food Industry (Manufacturing, Packaging)

Meeting the challenge of increased population, this industry must prepare to meet a growing market increasing from 68 billion in 1955 to 100 billion in 1965. Production will increase by 25% in 1960 to 50% in 1965. These conservative totals are based on present grease consumption figures projected to include the increase in population.

Transit Industry

The total common carrier and school bus figure of 231,996 vehicles operating at total of 4.59 billion miles in 1955 was taken from the Records of Bus Transportation Magazine Research Library. The total demand for increased transportation service in 1960 and 1965 was added and considering the trend of city to suburb and reverse move, it is estimated this industry will increase in scope, passengers carried and miles covered 25% in 1960 and approximately 50% in 1965. The number of school buses are estimated to increase from the present 134,972 units to 165,000 units in 1960 and close to 225,000 by 1965.

Trucking Industry

The basis for these figures are the records of the American Trucking Association, Inc., and U. S. Bureau of Public Roads which show registration of more than 9,750,000 trucks and trailers handling approximately 180 billion ton miles per year. It is estimated that the increase in this industry will closely parallel the increase in population.

Passenger Cars

The automotive grease consumption totals, shown here, are gauged according to the following explanation:

In 1955 some 50.3 million passenger cars operating over 525,132 billion miles, received a *chassis lube* job on an average of 1,233 miles, using an average of ¼ lb. of grease per job; front wheel bearings were repacked and universal joints, etc., were lubricated at an average of 7,500 miles using approximately ½ lb. of grease per job. In 1960 the number of passenger cars in service is projected to increase to 65,250,000 and in 1965 to 78,320,000.

Multi-luber data is based on 0.0035 ozs. of grease per fitting per cycle. Eleven fittings at 0.0035 = .0384 oz. per cycle or 180 cycles per 7 oz. can. The recommended method of multi-luber use is at the moment of starting and every 50-mile interval thereafter. Allowing for short trip and careless use of the multi-luber, about 7,500 miles could be covered on 1 7-oz. can. 37,000 units installed in 1955 covered 205.5 million miles at an average of 16,958 miles per pound of grease to a total of 12,000 lbs. used in multi-luber systems.

Available data published in *Ward's Automotive Reports*, December 19, 1955, on Lincoln-Mercury was used to project future Multi-Luber installations. The 1955 Lincoln-Mercury production shows that Multi-Luber units were installed on 36.9% of the Lincoln Models and 8% of the Mercury Models, or approximately 37,000 units. Projected installations were estimated at 50% of future Lincoln-Mercury production. On this basis, 50% of estimated production in 1960 would be approximately 218,375 units. Using an average mileage of 10,000 miles per year and the presently established consumption formula, these units would consume 185,719 lbs. of grease.

In the absence of available data or information of public acceptance and as a means of projecting Multi-Luber grease consumption to 1965, the 1960 require-

About the Author

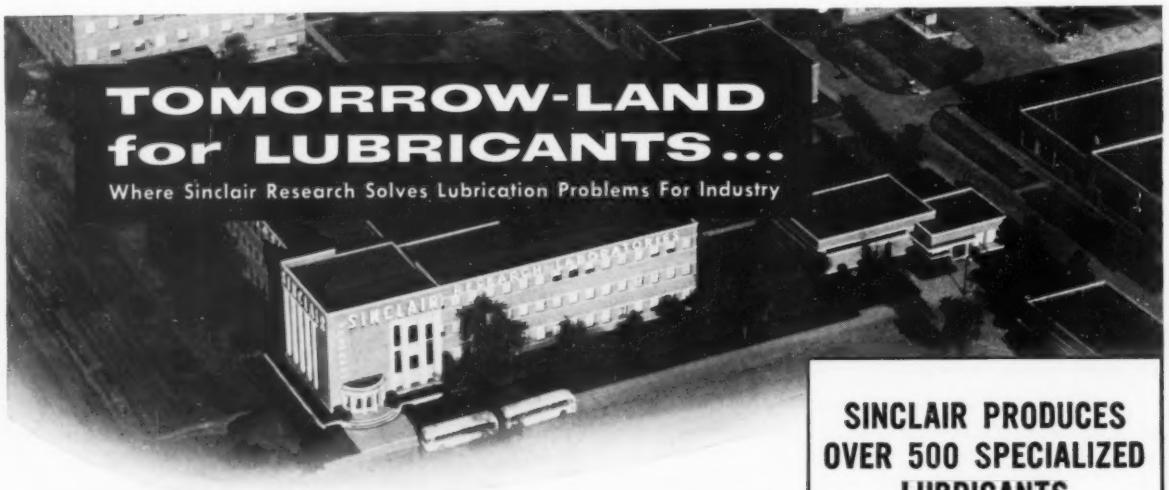
A. S. RANDAK *is Sinclair Refining company's manager of technical service. He was first employed by the company in* 1937 *as diesel engineer in the railway sales department, and later as chief automotive engineer in lubricating sales. Randak graduated from Purdue in* 1934 *with Bachelor and Master degrees in science and engineering respectively. His first employment was with Union Pacific Railroad. Randak is a member of SAE, ASTM, NLGI, ASME and ASLE, served the Air Force during the war.*

ment was increased by 50% which gives a figure of 278,359 lbs. to be consumed in Multi-Lubers in that year.

The mileage consumption per lb. of grease afforded through the use of Multi-Lubers would mean a loss in 1960 of 3,822,029 lbs. and in 1965, a loss of 5,732,893. There would be no reduction in front wheel bearing repacking or universal joint servicing, etc., providing the car manufacturers retain present designs.

But we are all aware of the tremendous developments in passenger car design and performance since 1945. The market for conventional gear lubricants is steadily declining as each year's production of new models show increased installations of automatic transmissions. Sealed rear axle housings accelerate this decline and generally this trend will continue. Although there may be some difference of thought within the industry on the subject, it is our opinion that virtually all passenger car production will be equipped with automatic transmissions by 1960, and that rear axle lubrication service will be eliminated on new models during the 1960-1965 period.

Further evidence of this design change trend is the reduction in chassis grease fittings which to date is 35% over 1950. This reduction, together with the automatic systems for automotive chassis lubrication, are resulting in an over-all reduction in grease consumption per vehicle. ■



Located at Harvey, Illinois, is one of the most extensive installations of its kind in the world—Sinclair Research Laboratories. These facilities are an important part of Sinclair's investment in the future. Here is where Sinclair engineers and chemists work to develop new products and improve the quality of existing ones. At these famous laboratories were developed the Sinclair lubricants now solving difficult problems in all branches of industry. If you have a special lubrication problem, write today to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y.

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NLGI (PROPOSED) LUBRICATING GREASE PRODUCTION SURVEY

Initial response on a questionnaire to NLGI Active members concerning the proposed Lubricating Grease Production Survey has been quite favorable, at the time the NLGI SPOKESMAN went to press. The committee organizing the components of what may be a new and effective Institute service is headed by Board member Dr. J. V. Starr, assistant manager of the lubricants and specialties division of Esso Standard Oil company, and it has been through the offices of this group that NLGI Active members, those grease manufacturers in the United States, have been queried. (For more details on the survey see President J. W. Lane's editorial on page 5 of this issue.) Since this project is of great interest to every type of membership classification, circularization of Active members is reproduced here to publicize this development:

June 3, 1957

To Active Members of the National Lubricating Grease Institute

Gentlemen:

Production statistics for the lubricating grease industry are non-existent. Many members of the Institute feel that reliable industry production figures would be of considerable value. We stress *production* data rather than sales because the latter usually do not consider re-seller sales, and hence tend to be inflated. In addition, publication of such data should be of value to our Associate members, e.g. suppliers of manufacturing equipment, dispensing equipment, containers, ingredients, and marketing organizations to whom we have certain obligations. The Board, therefore, appointed a Committee to study the possibilities.

Briefly, the proposed plan is this. Each producer of lubricating greases would report to an independent agency his annual poundage of production classified by type of soap thickener, e.g. calcium, sodium, aluminum, lithium, non-soap, etc. The assembling organization would merely publish the total figures in each category and give them wide distribution. No individual data would go to the Institute office nor to any member thereof. Counsel for at least two major producers have reviewed the proposal and report that there is no objection from a legal standpoint. It is obvious that the value of such a survey will depend on a very high percentage of manufacturers reporting.

The purpose of this letter is simply to obtain answers to the following two questions:

1. Would you be willing to participate in such a survey, preferably on an annual basis?

2. If so, could your production statistics be assembled for the year 1957? Your prompt reply will be appreciated.

Very truly yours,
(signed) JOHN V. STARR, *Chairman*
Production Survey Committee

As mentioned above, it is obvious that this would be an advantageous program for not only the Institute member firms but the government, the public and our many friends abroad. From a modest beginning such a survey could easily be expanded through the years to fit any need of the membership. A later report on the progress will be made to the membership, and comments and opinions are welcomed by the president, the chairman of the committee and the national office in Kansas City, Missouri.

NLGI 1956-57 Officers and Board of Directors

AN ASSOCIATION, a society, or an institute is a cooperative organization—usually representation is made up of a group of men in a particular industry—competitors in business, but working together voluntarily to promote their industry and business generally. Through a governing board the membership reflects its aims and desires concerning policy and planning. But voluntary assistance is needed to enact the organization's work and in this respect NLGI is fortunate in that it has a "working" board—every member of the governing body is responsible for one or more facets of the operation, giving freely of time and effort to strengthen the Institute's objectives . . . "To develop better lubricating greases for the consumer, better grease lubrication engineering service to industry." Shown here are the officers and directors of the National Lubricating Grease Institute and their committee assignments for 1956-1957.

President

J. W. LANE
Socony Mobil Oil Co., Inc.
Chmn: Executive
Chmn: Film

Vice President

R. CUBICCIOTTI
L. Sonneborn Sons, Inc.
Chmn: Program
Executive

Treasurer

A. J. DANIEL
Battenfeld Grease & Oil Corporation
Chmn: Finance
Executive
Film
Marketing Editorial

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Standard Oil (Indiana)
Membership
Film
Awards
Production Survey

D. P. CLARK
Gulf Oil Corporation
Finance
Nominating
Film
Marketing Editorial

H. P. FERGUSON
Standard Oil (Ohio)
Program
API-NLGI Joint
Container
Membership

service to the industry through guidance and participation in the institute's programs and achievements

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Chmn: Marketing Editorial
Program
Film
Production Survey

H. L. HEMMINGWAY
Pure Oil Company
Chmn: Nominating
Film
ASA liaison

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Awards
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Nominating

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Publicity
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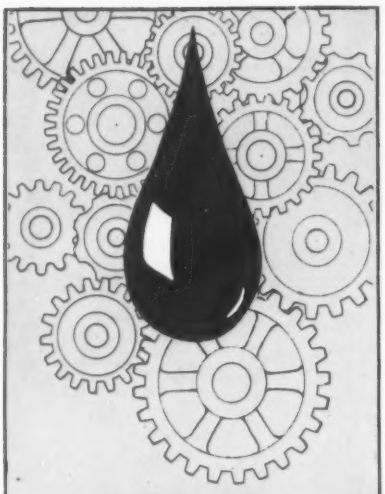
W. H. SAUNDERS, JR.
International Lubricant Corporation
Chmn: API-NLGI Joint
Container
Publicity
Production Survey
ASME Liaison

J. V. STARR
Esso Standard Oil Co.
Chmn: Production Survey
Awards
Film
Program

B. G. SYMON
Shell Oil Company
Film
Finance
Nominating
ASLE Liaison

Patents and Developments



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Since 1922

Gel Breakers for Heavy Metal Soap Gels

U. S. Patent 2,774,740 issued to Sidney J. Magram. Greases may be removed from mechanisms, containers, etc. in a matter of minutes by means of chelates which break the gel structure down to a thin liquid. The class of beta-di-oxo-compounds (1,3-dicarbonyl compounds), including enolizable compounds as aceto-acetates, malonates, beta diketones, etc., are particularly effective. About 0.1% to 0.5% of the chelating agent (such as 8-hydroxyquinoline), based on the weight of the gel, added to the gel as such or in the form of a solution, is considered adequate for complete gel breakdown.

Colloidal Clays as Grease Thickeners

U. S. Patent 2,766,209 to the Pure Oil company. Bentonite type material is heated at 250°F. to 650°F. to constant weight to remove bound water. After cooling, it is contacted with a selected diol or diol ether (propanediol, pentanediol, monobutyl ether of butanediol, etc.). About 5-25% of this modified bentonite added to a base oil will produce a grease-like consistency.

Bentonite-Quaternary Ammonium Compound Complexes in Greases

U. S. Patent 2,767,175 to General Mills, Inc. Reaction products made from difatty morpholinium halides are claimed to be thicker and stiffer than those obtained from the usual quaternary ammonium compounds. Bentonite is dispersed in water and the morpholinium compound solution is added at room temperature to produce the complex as a flocculent precipitate. A typical compound is the reaction product of dioctadecylamine with 2-chloroethyl ether. The complexes are used in the base oils in amounts of 5-10% to produce the greases.

U. S. Patent 2,767,176 to General Mills, Inc. The complexes in this patent include bentonite and polyquaternary ammonium compounds.

U. S. Patent 2,767,189 to General Mills, Inc. Here the bentonite is reacted with an aminoquaternary ammonium compound and with a quaternary ammonium compound containing two fatty groups.

U. S. Patent 2,767,177 to General Mills, Inc. In this patent the complex is produced by reacting bentonite with a polyamine and a monoquaternary ammonium compound containing two fatty groups.

Water-Resistant Grease Thickened With Inorganic Gelling Agents

U. S. Patent 2,766,205 to the Pure Oil company. Water resistance to inorganic gelling agents (e.g. silica aerogels) is imparted by addition of a cyclic amine stabilizer, such as a (preferably liquid) heterocyclic polycyclic unsaturated amine of an aromatic nature (e.g., quinoline). About 1-35%, based on the weight of the gelling agent, is used. The waterproofed gelling agents are added to the base oil in the preferred amounts of 5-14% by weight.

Complexes of Dissimilar Metals

U. S. Patent 2,767,209 to Lubrizol corporation. Organic salt complexes are described for various applications, including preparation of greases. These complexes include oil soluble acidic organic compounds or salts, e.g., at least one petroleum-derived sulfonic acid compound and at least one alkyl-aromatic sulfonic acid compound, together with a salt and base (basing material) furnishing the cationic salt-forming radical, and an acidic material (such as carbon dioxide).

Stable Gelled Hydrocarbons

U. S. Patent 2,789,040 to W. H. Goff and W. L. Banks of The Texas company. A gelling agent recommended particularly for lighter hydrocarbons is a straight chain wax oxidate having Neut. No. 150-275, and ratio of Neut. No. to Sap. No. of higher than 0.6.

People in the Industry

Southwest Grease Appoints Hedrick a Director

Southwest Grease & Oil company, one of the world's largest independent manufacturers of grease, announced the election of Frank E. Hedrick to the company's board of directors.

H. A. Mayor, Southwest's president, said, "It is with a great deal of pleasure that we announce the appointment of a new director with the business experience and background of Mr. Hedrick." Mayor added that the election of Hedrick marked another step forward in the growth and expansion of the company's activities. Southwest has sales outlets all over the United States, Canada and Latin America. The company's biggest customers are major oil companies.

Hedrick is vice-president and director of Beech Aircraft corporation, president and director of Beech Acceptance corporation, Inc., and treasurer and director of Beechcraft Research & Development, Inc. He also serves as a director of the East Side State bank and the East Side State Bank Building corporation.

The Beech executive is a former vice-president and director of E. S. Cowie Electric Co. of Kansas City and a former secretary and director of the Lamar Automotive Supply Co. of Salina.

Chittick Retires from American Mineral Spirits

Colonel M. B. Chittick, one of the founders of NLGI, second president of the Institute (1935-36), and recipient of NLGI Service to Industry award at the 1956 Annual Meeting, now lists his permanent address as 785 Via Lombardy in Winter Park, Florida.

He writes that as of May, 1957 he retired from the Pure Oil company and the subsidiary company with which he was last associated . . . the American Mineral Spirits company.

Frech, Balcrank Secretary-Treasurer, Deceased

Jacob B. Frech, former secretary-treasurer and credit executive of Balcrank Inc., Cincinnati, died of a heart attack at his Cincinnati home, May 13. He was seventy-two.

Balcrank Inc., manufacturers Shott aluminum furniture; Balcrank industrial pumps, lubrication equipment and machine tool parts; and Brookins service station equipment.

Mr. Frech, who had been with Balcrank Inc., since August, 1939, had retired from the firm just two weeks prior to his death. A native of Cincinnati, he was educated in the Cincinnati public schools. He was a graduate of the LaSalle Extension school of the University of Chicago, and had done post graduate work in commercial law and accounting at Cincinnati's Salmon P. Chase College.

Prior to joining Balcrank Inc., he was associated with several manufacturing, wholesale, retail accounting and mail order firms. He had been active in business since 1905.

Farval Elects President And Board Chairman

The Cleveland Worm & Gear company and its affiliate, the Farval corporation, announce the election of George H. Acker as president and Howard Dingle as chairman of the board of both companies. All other officers were re-elected, including Willis W. Clark, vice-president. Before his election to the presidency, Mr. Acker held the post of executive vice-president and Mr. Dingle was president.

Dingle

Acker

The Farval corporation, a totally owned subsidiary and leading producer of centralized systems of lubrication for all types of indus-

Continued on page 30

DARLING'S

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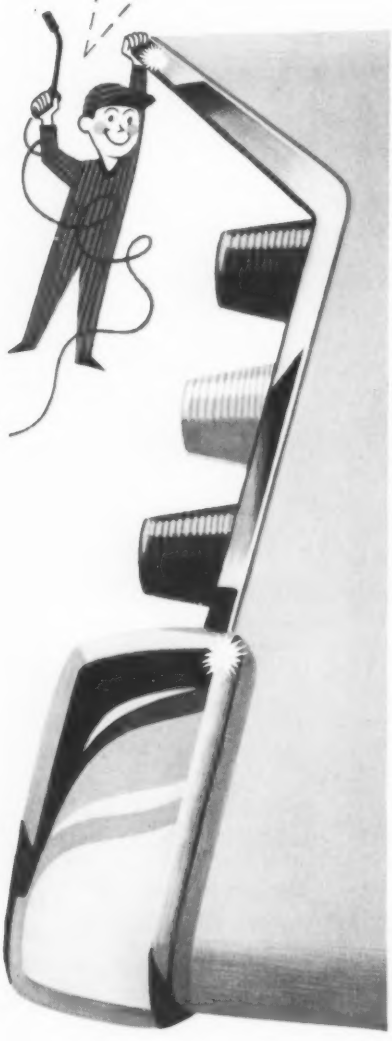

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Penola

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trial equipment, was acquired by Cleveland Worm Gear in 1932. A third manufacturing branch, the Cleveland Speed Variator division, was established in 1954 for the production of a precision mechanical variable speed drive to meet the requirements of critical speed-changing applications.

API Marketing Division Appoints B. W. Cecil

Appointment of Brice W. Cecil as marketing assistant in the Division of Marketing of the American Petroleum Institute was announced by Adam J. Rumoshosky, marketing division director.

In addition to general duties as a member of the Marketing Division staff, Cecil has the specific assignment of working with the division's personnel training committee and its advisory group, the marketing training council. He will also serve the committee in assisting and coordinating the activities of oil marketing groups in the field of distributive education.

A native of Texas, Cecil served as assistant director of distributive education in the state Department of Education before joining the API.

Shields Retires After Thirty-two Years With Emery

William H. Shields, assistant to the research director of Emery Industries, Inc., has announced his retirement. A veteran of thirty-two years with Emery, he is well known throughout the chemical, textile, and dry cleaning industries.

Shields joined Emery's research staff upon graduating from the University of Cincinnati in 1925. He spent several years during the 1930's in Emery's New York and Charlotte, N. C., sales offices, returning to the research department in 1941. In 1943, Shields was appointed assistant research director, heading Emery's Textile and Sanitone research department. He directed the planning and erection of Emery's Twitchell Memorial Laboratories, which were dedicated in 1955.

Shields is a member of the American Chemical Society, the American Association of Textile Chemists and Colorists, and the American Oil Chemists' Society.

Steel Container Authority Named BDSA Consultant

Mueller, Collier, McCoy, McCarthy

Vern I. McCarthy, Jr., (right) vice president of Vulcan Containers Inc., of Bellwood, Ill., recently completed a six month tour of duty in Washington as deputy director of the containers and packaging division, business and defense services administration, U. S. Department of Commerce and has now been named as a consultant to the agency. McCarthy, a specialist in the steel shipping container industry, will serve as a volunteer authority for the containers and packaging division. He is also a member of the BDSA unit of the National Defense Executive Reserve, organized by the Office of Defense Mobilization to establish an effective nucleus reserve of business executives to serve in key positions with the Federal government in event of a national emergency. When McCarthy completed his

active duty assignment in Washington, H. B. McCoy, (second from right) BDSA Administrator, presented him with a flag which flew from the Capitol building. Congratulating McCarthy at the ceremony are Rep. Harold R. Collier (R., Ill.) and Frederick H. Mueller, (left) Assistant Secretary of Commerce for Domestic Affairs.

Kludt Named Lincoln Executive Vice-President

Mr. Jonathan Kludt has been elected executive vice president and general manager of the Lincoln Engineering company by the board of directors of the McNeil Machine & Engineering company, Akron, Ohio. The announcement was made following a recent board meeting.

Mr. Kludt joined Lincoln in 1934, and soon became vice president in charge of production. In April of 1956 when Lincoln merged with the McNeil organization he was elected general manager of the Lincoln division.

McNeil is an internationally known manufacturer of tire molding and rubber processing equipment. The Lincoln division is internationally recognized as a leader in its field of designing and building lubricating equipment, serving all major industries.

Nopco Announces Scholarship Winner

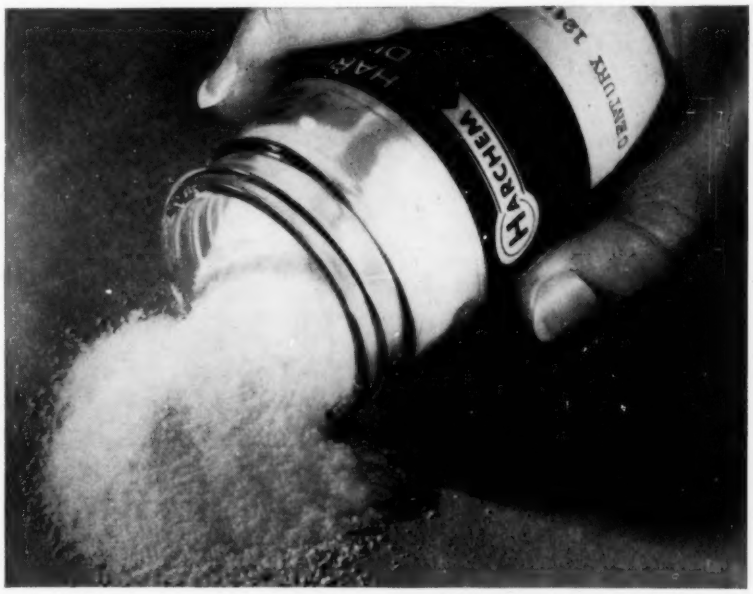
Ralph Wechsler, president of the Nopco Chemical company, has announced the recipient of the Charles P. Gulick Scholarship for 1957. Winner of the scholarship is Charles Arlin Zebeau of Cedartown, Georgia. Mr. Zebeau is the son of Ernest Zebeau, production foreman at Nopco's Cedartown plant.

Official presentation of the award was made on May 17 at the Cedartown plant. Nopco vice president H. A. Batley and plant manager R. Lamar Jones represented the company with Mr. Batley making the award.

Mr. Zebeau is the second person to receive this scholarship. It was established by Nopco's Board of Directors in March 1956 to honor the memory of Charles Platt Gulick, founder of the company, who passed away in 1955. Last year's winner, the first recipient of the award, was Miss Marion L. Porter. Miss Porter, the daughter of Nopco engineer, is attending Colby college in Maine as a language student.

The Charles P. Gulick Scholar-

Continued on page 32



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H-27

ship, awarded annually to a son or daughter of a Nopco employee, has a value of $750 per year for four years at the college of the recipient's choice. Candidates are judged on the basis of scholastic achievement, financial need, character, and well-rounded personality by a committee of three prominent educators.

Mr. Zebeau will graduate in June from Cedartown High School. He is a member of Hi-Y and was secretary-treasurer in his senior year. He plans to attend the University of Georgia.

New Managerial Appointments at Aro Equipment

Aro Equipment corporation of Bryan, Ohio, manufacturers of lubricating equipment, announce new managerial appointments to E. C. Messervey and J. H. Thurow. Messervey is Chicago branch manager and northern Illinois division manager of the Arolube division. Thurow is division manager in Minneapolis. He will be responsible for distributor sales of Arolube equipment in Minnesota, North Dakota, South Dakota and eleven counties of western Wisconsin.

Messervey

Thurow

Messervey will be in charge of all sales in Chicago, northern Illinois and Lake County, Indiana. Assisting him will be L. Raymond, Jr. and J. Wilson, sales representatives, W. Tyke, service manager and G. Kennedy, office manager. His department will call on all major oil companies, car manufacturer personnel and wholesale outlets serving automotive and farm markets in the area.

Messervey With Aro Since 1940

Messervey started with Aro at the Detroit branch in 1940 and advanced to assistant office manager. During World War II, he served with the military police corps and spent eighteen months in the European theatre. He has served in the Aro lubricating division handling automotive, farm and industrial sales, and as supervisor of fram sales. In 1956, he was appointed assistant manager of automotive sales and held this position until his recent promotion.

Thurow received his B.M.E. degree in 1948 and since that time has served as a sales correspondent for makers of industrial heat treating equipment; a sales engineer for a distributor of refractory materials and foundry supplies in the Minneapolis area; in 1951, he joined Sinclair Refining company as an industrial sales representative in the twin-city area, servicing consumer industrial accounts. In 1955 he was promoted to lubrication engineer and transferred to Des Moines, Iowa. He remained in this position until joining Aro.

Kaufmann Appointed Werner G. Smith, Inc. Sales Agent

Werner G. Smith, Inc., 1730 Train Avenue, Cleveland, Ohio, announced that E. W. Kaufmann will handle sales of their sperm oil and chemical products in the Philadelphia area.

A chemical engineering graduate of Lehigh university, Mr. Kaufmann has spent twenty years in sales and technical service in the Philadelphia area. He will act as a manufacturer's agent, contacting the paint, resin, chemical, textile, soap and detergent, cosmetic and wax compounding industries.

HARSHAW LEAD BASE

Harshaw Lead Base, as an additive to petroleum lubricants, improves extreme pressure characteristics and imparts the following desirable properties:

- Increased film strength
- Increased lubricity
- Improved wetting of metal surfaces
- A strong bond between lubricant and metal surfaces
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Harshaw Lead Bases are offered in three concentrations to suit your particular needs:

Liquid	Liquid	Solid
30% Pb	33% Pb	36% Pb

Other metallic soaps made to your specifications. Our Technical Staffs are available to help you adapt these products to your specific needs.

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Almost everything that moves either in actual operation or in the process of its making . . . from gate hinges to tractor wheels . . . depends upon grease. That is why lubricants should be bought with care. You can always depend upon Deep Rock highest quality greases and lubricants. They are manufactured to give top lubrication to all moving parts.

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Jayhawk Manufacturing Co., Inc.

120 North Adams Hutchinson, Kansas

Acheson Colloids Announces Personnel Appointments, Gedag Addition

Stock

Arthur J. Stock has been appointed research and development manager for Acheson Colloids company, Port Huron, Michigan, a division of Acheson Industries, Inc. Stock replaces Dr. Harold J. Dawe who is now research director for Acheson Industries, Inc.

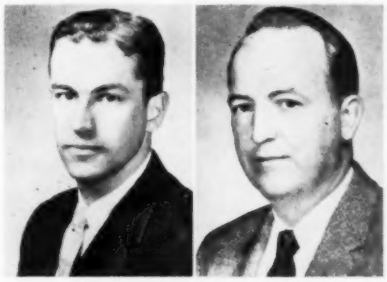
Stock was formerly a research chemist with the Truscon Laboratories division of Devoe & Raynolds Co., Detroit, and production manager for Henneberry Rotogravure, Chicago. Before joining Acheson he was project director for Chicopee Manufacturing corporation, Springfield, Mass.

Stock received his B.S. in chemical engineering from Wayne University and did graduate work at the University of Michigan and Illinois Institute of Technology. He is a member of the American Institute of Chemical Engineers, the American Chemical Society and the Engineering Society of Western Massachusetts.

Two New Service Engineers

The appointment of Kurt R. Student and Connell J. Gallagher as service engineers has been announced.

Mr. Student will work out of Acheson's Cleveland office, located at 12429 Cedar Road, and will serve the Northern Ohio territory. He attended East Technical High School in Cleveland and did undergraduate work in mechanical engineering at Ohio State University. He is a member of the American Society for Metals. Prior to joining Acheson, Mr. Student was a sales and service representative in Cleveland for Williams & Co., Perfection Stove Co., and International Nickel Company's Alloy Metals division. He replaces R. G. Hartnett who has been promoted to staff service engineer at Acheson's headquarters in Port Huron.



Student Gallagher

Mr. Gallagher has been assigned to Acheson's Pittsburgh office, lo-

Continued on page 34

Industry News

Acheson Colloids

Continued from page 33

cated at 530 Sixth Ave., and will cover Western Pennsylvania and West Virginia. He attended St. Ann's School in Freeland, Pa., the McCann School of Business, Hazleton, Pa., and the University of Pittsburgh. He is a member of the Pittsburgh Junior Chamber of Commerce and the American Legion. Prior to joining Acheson, he was an assistant manager with the Home Life Insurance Co. and a salesman for C. F. Pease Company. He replaces David H. Lynn.

Gredag Sales Transferred to Acheson Colloids

Effective June 1, 1957, Gredag, Incorporated, formerly of Niagara Falls, New York, a division of Acheson Industries, Inc., transferred their sales activities to Acheson Colloids company, Port Huron, Michigan.

All business transactions related to the sale of 'Gredag' greases, oil and synthetic lubricants will be carried on as the Gredag department of Acheson Colloids company, located at 1635 Washington Ave., Port Huron, Michigan.

According to Mr. William Ewart, who will continue to head 'Gredag' sales, all inquiries and purchase orders should be sent to the new Port Huron address.

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People that count"*

Navy Asks NLGI Aid on New Lubricant Specification MIL-L 19701 (NOrd)

The standards, materials and specifications branch of the research and development division, Department of the Navy, has contacted the national office of NLGI with regard to the intention of the Navy's bureau of ordnance to establish a Qualified Products list for Lubricant, All-Weather, Semi-Fluid, for Aircraft Ordnance under Specification MIL-L-19701(NOrd).

Companies which have a product meeting the requirements of this specification are urged to contact the Chief, Bureau of Ordnance, Department of the Navy, Washington 25, D.C., for an opportunity to have their products tested, since in making future awards consideration may be given only to such products as have been tested and accepted for inclusion in the Qualified Products list.

High-Temperature Airframe Bearing Investigation

To obtain design data and information on modes of failure for rolling-contact bearings operating at temperatures ranging from 300°F to 600°F, Battelle Institute has started a program of research for the Wright Air Development Center, Wright-Patterson Air Force Base, Ohio.

Increasing temperature demands on airframe bearings in high-speed aircraft and guided missiles have pushed bearing requirements beyond the range of current design information. "Data are practically nonexistent for heavily loaded oscillating bearings in the 300°F to 1200°F range," according to Battelle technologist C. M. Allen, "and bearings and lubricants for airframe applications are not known which can be operated beyond 1200°F."

The present investigation at Battelle is the first phase of a three part program that has the ultimate objective of developing new bearings and lubricants and adequate design data for bearings to operate at these higher temperatures.

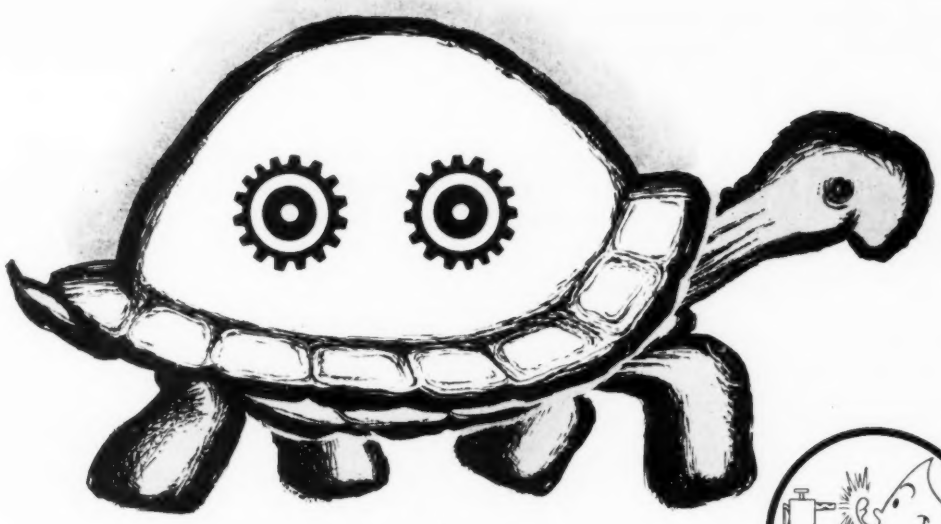
An evaluation of currently available bearings to obtain design data and information on modes of failure in the temperature range of 300° to 600°F constitutes the first phase. It will include a survey of a number of bearing producers and users to aid in determining some of the limitations and problems involved in the use of airframe antifriction bearings. Up to 1500 bearings may be evaluated in load-life experiments for the development of design data. In both the survey and the experimentation, a prime objective of this research for the Air Force will be to develop load-life data and an increased understanding of the mechanism of failure at moderately high temperatures.

The mechanism of failure at elevated temperatures is not known except that above a certain temperature level, depending upon the material, surface fatigue may not be the dominating mode of failure. Rather the failure, Allen says, might progress as a result of creep or plastic flow and wear.

"Teflon" Offers Filtration Process

Highly porous fibrous sheet made of "Teflon" tetrafluoroethylene resin offers interesting prospects in filtration processes, according to the Du Pont company's fabrics division where this new class of materials is currently under development.

"Armalon" tetrafluoroethylene fibrous sheets to which the fabrics division has given the trademark, "Armalon," combine properties suggesting their use as filter media



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INLUCITE 21 "stays put", lets no ordinary deterrents like moisture, heavy loads or extreme temperatures interfere with its remarkable mechanical stability, and adhesion.
That's why this unexcelled grease provides more dependable, longer-lasting protection for wheel bearings, water pumps, universal joints, shackles and other grease-lubricated bearings.

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where other paper-like structures are not satisfactory. In the matter of heat resistance, these sheets can withstand seven days' exposure at 550°F. Their chemical resistance has been tested by seven days' immersion in concentrated sulfuric, hydrochloric, nitric acids, etc. Specific uses for "Armalon" sheet might include filtration of strong acids and bases, virtually all solvents, liquid fuels, lubricants, and hydraulic fluids over a wide temperature range.

"Armalon" Removes Fine Particles

Laboratory data indicate that "Armalon" fibrous sheets are effective in removing very fine particles from liquid suspensions under severe conditions. Another potential application is the removal of suspended particles from hot, corrosive gases. Not readily wetted by water, the new materials may also be useful for separating water droplets from many organic liquids, such as gasoline.

Another application under consideration is battery vent seals which will allow passage of gases, yet prevent leakage of electrolyte.

Since the "Armalon" tetrafluoroethylene fibrous sheets are made from "Teflon" tetrafluorethylene resin they are serviceable at temperatures from below minus 100°F to plus 400°F. (or higher under certain conditions). They will withstand attack of strong acids and bases, and are unaffected by water or any common fuels, lubricants, hydraulic fluids, and solvents. They will not adhere firmly to any known materials, and have an extremely low coeffiicent of friction.

Technical data on "Armalon" fibrous sheets are available in New Products Bulletin No. 6, Room 7017-D, Du Pont company, Wilmington 98, Delaware.

"Breaking Lubrication Barriers" Available

"Breaking Lubrication Barriers," a 16-page brochure in four colors which completely covers the history and development of the Molykote line of molybdenum disulfide lubricants has been published by the Alpha Molykote corporation, Stamford, Conn.

A veritable textbook on the technical aspects of molybdenum disulfide as an extreme pressure lubricant, the bulletin covers the physical and chemical properties of the compound as well as providing charts which prove its superior lubricity.

Section on Lubrication Coatings

Featured in the book are: (a) a catalog-type selection table; (b) four full pages of photographs showing a variety of uses; and (c) a section on bonded solid film lubricating coatings.

Bulletin 106, revised to incorporate new operating information on the model LFW-1 lubricant-friction-wear testing machine, has also been released. Included in the bulletin is a more complete description of the machine's operation as well as a revised list of specifications in the English and metric systems.

Copies of the bulletin may be obtained by writing directly to the Alpha Molykote corporation, 65 Harvard Avenue, Stamford, Connecticut.

New Offices for American Lithium Institute

The American Lithium Institute, Inc., will move to new and larger quarters on the fourth floor of 32 Nassau Street, Princeton, N. J. on or about June 1st. The Institute is currently at 84 Nassau Street in Princeton, N. J.

A non-profit corporation, the Institute was recently formed to broaden the present markets for lithium and its compounds and develop new markets through the sponsorship of research and the dissemination of information.

Mail for the Institute should be addressed to P. O. Box 549, Princeton, New Jersey.

AP & CC Offers New Technical Sales Unit, Publishes Catalogue

American Potash & Chemical corporation has established a technical sales services section to act as coordinating unit among the company's production market development and sales departments.

Announcement of the technical services section was made by W. J. F. Francis, AP&CC vice president in charge of sales, who said the newly formed section would be a part of the sales department but would provide liaison on technical matters to the various departments.

Daniel A. Lundy, formerly western sales supervisor of boron and lithium products, will be western manager of the new section, while Nelson E. Wendt, previously head of northeastern sales, will be eastern manager. Lundy and Wendt will operate from the company's Los Angeles and New York offices respectively.

"The technical services section was formed as a result of the company's 400 per cent increase in sales during the past ten years," Francis

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said. "Because of the rapid growth, it became necessary to set up a coordinating unit to handle technical information on product properties, uses, packaging and applications not only to the various AP&CC divisions but also to customer companies."

A key function of the section will be in connection with the transfer of new products from AP&CC's market development department to the sales department. This is important because of the many chemicals being developed by the company as part of its long-range research and development program.

New Products Catalogue

A complete 12-page products catalogue and informational booklet has been issued by American Potash & Chemical corporation.

The catalogue includes a description, properties and applications of nearly 70 chemicals marketed under the company's Trona trademark.

Among major product groups included in the booklet are boron chemicals, soda products, potassium compounds, bromines, lithium products, electrochemicals, agricultural chemicals and refrigerants.

The brochure also includes information on newer lithium and boron chemicals in developmental stages, which are finding interest in the rocket and missile fields as well as other industrial processes.

In addition to product information, the booklet contains material on AP&CC's research and development program, the quality control program and the various AP&CC facilities located at Los Angeles Whittier and Trona, Calif.; Henderson, Nev.; San Antonio, Texas, and West Hanover, Mass.

Copies of the booklet may be acquired by writing American Potash & Chemical corporation, 3030 West Sixth Street, Los Angeles 54, Calif.

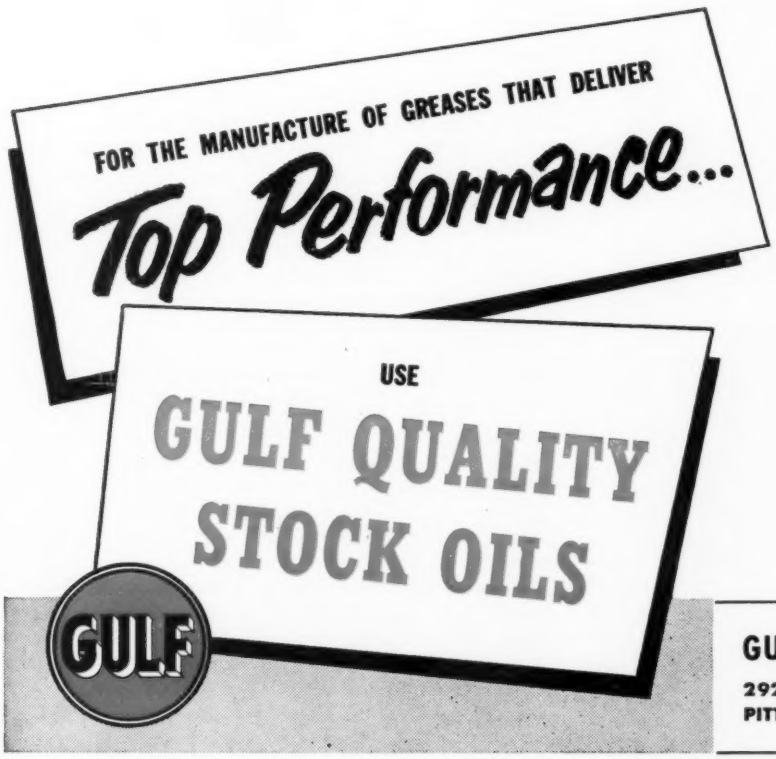
Reserve Award Goes To Richfield Oil

The coveted Reserve Award of the U. S. Department of Defense was presented to the Richfield Oil corporation recently for outstanding cooperation with the Armed Forces vital reserve program.

In a brief, colorful public ceremony at the historic Presidio of San Francisco, Lt. Gen. Robert N. Young, commanding general of the Sixth Army, presented the award and its accompanying citation and pennant to Charles S. Jones, Richfield president.

Authorized and signed by Defense Secretary Charles E. Wilson,

Continued on page 40



A COMPLETE line of stock oils, quickly available to you through strategically located warehouses, terminal facilities, and refineries in 31 states from Maine to New Mexico. Also quality petrolatums.

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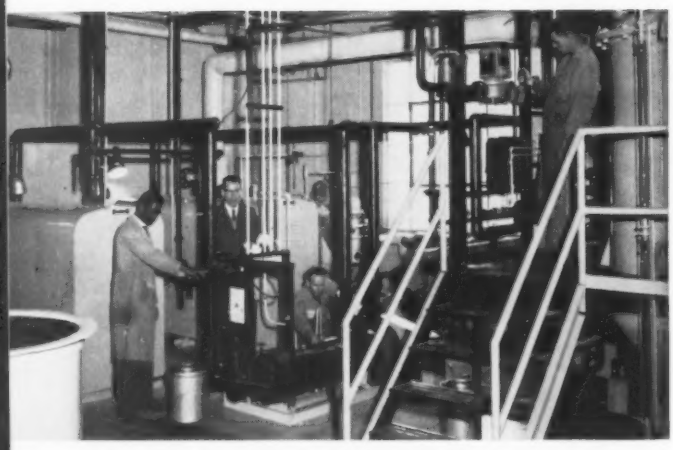
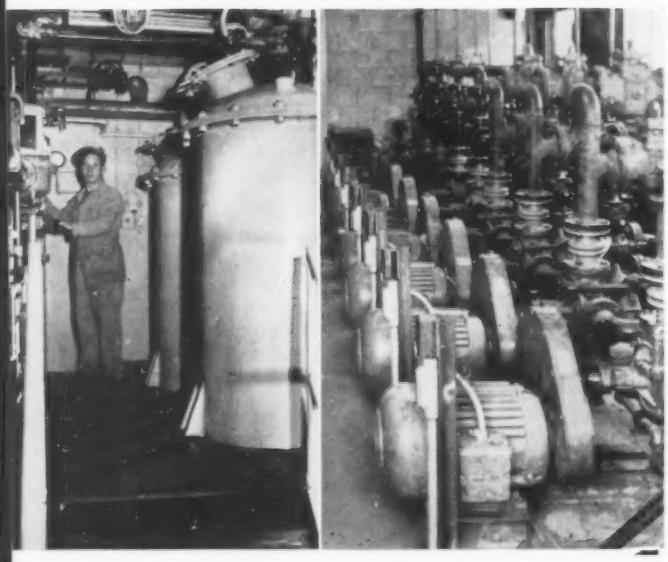
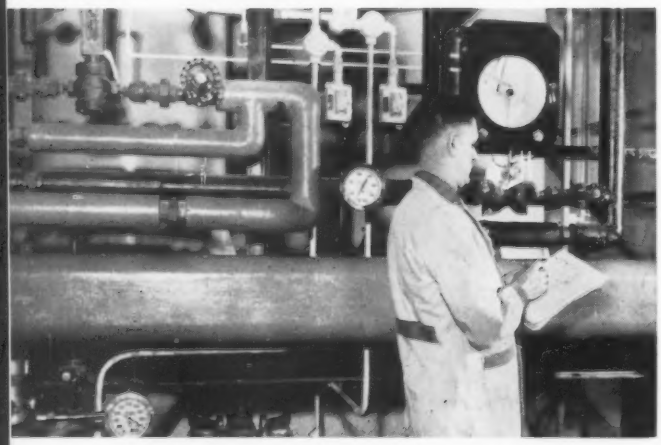






A NEW ENTRY into the allied petroleum products industry in Canada is Surpass Petrochemicals Limited with plant and offices in Scarborough, Ontario. Formed on May 15, 1955 with James E. Shields as president, the company is currently active in two broad fields: lubricants and lubricant additives; and corrosion control chemicals.

In the lubrication field Surpass has a continuous grease production unit now on-stream. Designed by the Girdler company, this unit has an ultimate capacity of 26 million lb/year. Although it was designed specifically for lithium base greases, the equipment can be simply adapted to production of other multi-purpose types such as barium, barium-lithium and the organophilic gel types. A broad line of multi-purpose greases are now being offered to the trade.

In the line of lubricant additives, a continuous sulphonation unit is now under construction with completion scheduled for June 1, 1957. Initially, a series of petrolum sulphonates will be produced in this 6,000,000 lb/year unit, but here again, flexibility is being built into the plant so that synthetic type sul-

New Member

nlgi

phonates can be produced if and when the market situation appears favourable. The petroleum sulphonates find their greatest use in high detergency motor oils and as components of metal working lubricants.

In corrosion control, Surpass has exclusive manufacturing and sales rights in Canada for the Alox line of corrosion control additives. These include, in addition to the conventional rust preventive bases, such specialized products as a jet fuel additive, a "down-the-well" inhibitor for crude oil gathering systems and refinery equipment and a Government approved replacement for blown rape seed oil in marine engine lubricants.

Surpass has recently begun marketing a complete line of finished rust preventives for the protection of metals during storage, processing and transit. Borrowing from the wide experience of Alox corporation built up over 30 years in the field, Surpass is offering to the metal working industry a specialized, custom rust preventive service, wherein rust preventive compounds are designed to meet the customers' specific situations.

INSIDE the Surpass plant at Scarborough, Ontario are, top to bottom, votator lithium grease making equipment, slurry tanks filled with petroleum oil, pumps and gauges.

NLGI Company Representative

F. W. Evans

Mr. Evans is a graduate in chemical engineering from the Cooper Union and has had thirteen years of diversified experience in the synthetic organic chemical field from 1943-1946 while with the Hooker Electrochemical company in Niagara Falls, N. Y. He recently obtained a Master of Business Administration degree from the University of Buffalo. He is a member of the National Society of Professional Engineers, The American Institute of Chemical Engineers and Beta Gamma Sigma, honorary business fraternity.

Surpass Petrochemicals Limited Joins Institute

Mr. Phoenix graduated in chemistry from The University of Toronto in 1946 after serving as an instructor in the Royal Canadian Artillery. He has some eleven years industrial experience, first as an analytical chemist in the consulting field, then as plant chemist for Canadian Johns-Manville, and later with Shell Oil company of Canada as a research and development chemist.

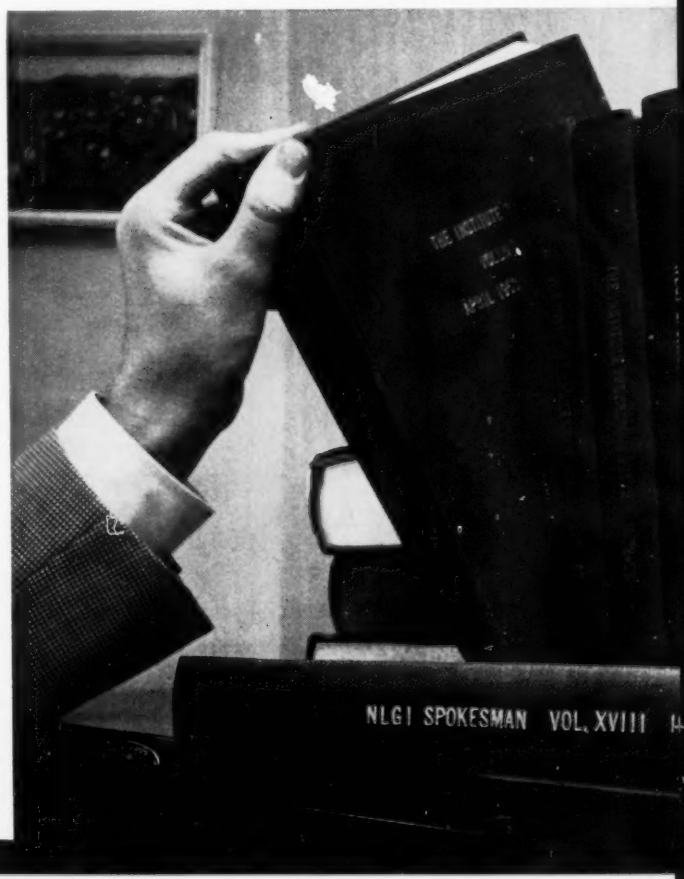
At Surpass he participated in the commissioning of the grease plant, and has been active in grease development. He has been a professional member of the Chemical Institute of Canada for nine years, and recently became technical representative to N.L.G.I.

Mr. Shields, who is president and technical director of Surpass in Toronto, is vitally interested in the continuing development of lithium-based lubricants for domestic and world use.

A synthetic Scotsman who refers to his work as "putting tails on molecules," Mr. Shields is recognized as one of the foremost corrosion engineers on the continent. Author of several U.S. and Canadian patents, he is a member of the National Association of Corrosion Engineers and the Engineers club of Toronto.

NLGI SPOKESMAN INDEX

A COMPILATION OF FIVE years, the NLGI *Spokesman* . . . from Volume XV through Volume XX, April 1952 through March 1957, containing authors, titles and classifications indexed by Industrial Arts index and Chemical Abstracts. Complimentary copies of this index are available to all subscribers of the journal of the National Lubricating Grease Institute . . . merely write to NLGI's national office and the index will be mailed immediately.



Reserve Award to Richfield

Continued from page 37

the award was given Richfield for aiding and encouraging its employees to participate in reserve activities and training; helping to design and equip a mobile petroleum products laboratory for the 968th Quartermaster Corps, which has been widely adopted by other U. S. military units; and the "live" public service television show, "Success Story," which presented a dramatic story of the 91st Infantry division and the reserve program.

Amalie Div., Sonneborn, Wins Public Service Award

The Amalie division of L. Sonneborn Sons, Inc., has been awarded the Golden Anniversary Certificate of Public Service by Brand Names Foundation in commemoration of the Amalie trademark's half century of existence.

In addition to honoring the division's trade name, the award gives recognition to Amalie as one of America's pioneer refiners of Pennsylvania crude oil.

REMMEL, left, receives Brand Names certificate from Abt. Sonneborn's advertising manager Hoyer looks on.

Chester H. Remmel, sales manager, in receiving the certificate from H. E. Abt, of Brand Names Foundation, noted that for the past 50 years, the sales of Amalie Pennsylvania Grade motor oils have grown with those of the motor car.

Continued sales growth, he said, is now being realized through the marketing of products of equally high quality for use in a variety of allied fields. One of these is X-L-O diesel engine oil, a product developed after years of research and field tests to meet the critical lubrication demands of diesel engines.

Lubricating oil for marine outboard motors is another product of the Amalie division which is enjoying widepread acceptance.

Increase in Distribution

The division's scope of domestic distribution is also growing rapidly, Remmel said. It is being spread to new areas of the country as fast as refinery production can be adjusted to the increased demand, he explained.

In addition to motor oils, Amalie's Franklin refinery produces gasoline, kerosene, specialized solvents, and fuel oils. The refinery, as a division of L. Sonneborn Sons, Inc., is an integrated operation.

Bartlett Elected Socony Vice President, Case Retires

Fred W. Bartlett was elected vice president in charge of producing, Socony Mobil Oil Company, Inc., at a meeting of the board of directors following the annual shareholders meeting today. He succeeds John C. Case who is retiring July 1, after 45 years of service.

Mr. Bartlett joined Socony Mobil in 1939 after 17 years of oil experience in the United States and Mexico. He was appointed chief geologist of Socony Mobil Oil company de Venezuela, holding that position until moving to Socony Mobil headquarters in New York as assistant chief geologist in 1943. Four years later Mr. Bartlett was named assistant to Mr. Case. Mr. Bartlett was general manager of the producing department between 1949 and 1953, when he was elected to the board of directors. He is a graduate of the University of Michigan, class of 1921. He is married and lives in Stamford, Conn.

Joined Socony in 1912

Mr. Case has been with Socony Mobil and its predecessors since 1912. After serving in the United

Continued on page 41

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LUBRICATING GREASES

New Golden Chassis Lubricant Marketed by Quaker State Oil

A new "Golden Chassis" lubricant which gives extra protection to ball-joint steering knuckles and modern spring suspensions, has recently been introduced nationally by Quaker State Oil Refining corporation, Oil City, Pennsylvania. Golden Chassis lubricant, according to the Quaker State people, derives its rich color from a new additive which enables the grease to cover all chassis points with a tougher, longer-lasting lubricating film that withstands better than ever the extra stress which modern design places on chassis points.

Bartlett Elected

Continued from page 40

States and abroad, he became manager of the foreign producing department in 1937. Six years later he was elected a director of the company in charge of producing. He was elected a vice president in 1946.

"Presenting Lithium" Available from Institute

"Presenting Lithium," a fifteen-page tabbed booklet, has just been issued by the recently formed American Lithium Institute, Princeton, New Jersey. The booklet describes the properties, uses, research potentials and availability of lithium and its unique compounds and discusses the function of the Institute itself.

The current uses of lithium and its compounds in ceramics, automotive greases, air conditioning and welding and brazing are reviewed as are applications in alkaline storage batteries, metals refining, and organic synthesis.

Research Possibilities Cited

In an unusual feature, the booklet outlines attractive research possibilities. As potential areas for lithium research, the booklet suggests the development of stronger glasses with improved electrical properties; the development of whiteware ceramics and refractories with better thermal shock resistance; the manufacture of new and workable light alloys; as well as the modification of heterogeneous catalysis and studies of polymerization and other catalytic organic reactions. Other lithium research possibilities mentioned are the use of lithium additives for the successful electrodeposition of other metals; the study of alkali reactions based on lithium's behavior as a non-typical alkali ion; the synthesis and formation of liquid and solid propellants; and the preparation of ferromagnetic spinels in electronics.

Copies of the booklet, "Presenting Lithium," are available on request from the American Lithium Institute, Inc., P. O. Box 549, Princeton, New Jersey.

Kerr-McGee Votes Saunders Vice President

Election of J. B. Saunders, president of Triangle Refineries, Inc., as a senior vice president of Kerr-McGee Oil Industries, Inc., was announced by company president Dean A. McGee.

Saunders will continue to head the management of Triangle, a Houston, Texas, company which operates product terminals and sales offices in 15 states of the Midwest and South. Kerr-McGee recently acquired all the capital stock of Triangle, which will operate separately.

"New England" Motor Operated Globe Valve

New and unique in principle, the patented "New England" motorized valve, incorporates almost

Continued on page 44

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American Flange & Manufacturing Company, Inc.
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Representative—Richard L. Parish, Jr.

Bennett Industries
Peotone, Illinois
Representative—S. A. Bennett

Central Can Company
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Representative—Henry Frazin

Cleveland Container Company
4925 So. Halsted St., Chicago 9, Ill.
Representative—R. D. Sayles

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Representative—C. K. Hubbard

National Steel Container Corp.
6700 South LeClaire Ave., Chicago 38, Ill.
Representative—Henry Rudy

The Ohio Corrugating Company
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Representative—Lawrence F. McKay

Republic Steel Corporation
Container Division
465 Walnut Street, Niles, Ohio
Representative—Theodore Humphrey

Rheem Manufacturing Company
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Representative—F. J. Blume

Rieke Metal Products Corporation
Auburn, Indiana
Representative—Mahlon E. Rieke

Steel Package Division of National Lead Company
722 Chestnut Street, St. Louis 1, Missouri
Representative—Warren T. Trask

United States Steel Products
Division, United States Steel Corporation
30 Rockefeller Plaza, New York 20, N.Y.
Representative—Wm. I. Hanrahan

Vulcan Containers, Inc.
P. O. Box 161, Bellwood, Illinois
Representative—H. B. Scharbach

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Representative—C. W. Nofsinger

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Representative—D. G. Reed

Balcrank, Inc.
Disney near Marburg, Cincinnati 9, Ohio
Representative—Richard P. Field

Gray Company, Inc.
60 Northeast 11th Ave., Minneapolis 13, Minn.
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Terrace Hill, Ithaca, N. Y.
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Representative—I. L. Carmichael

D-X Sunray Oil Company
Mid-Continent Bldg., P.O. Box 381, Tulsa, Okla.
Representative—J. W. Basore

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Representative—H. F. Wagner

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100 East Ohio Street, Chicago, Illinois
Representative—S. F. Graham

Ohio Farm Bureau Cooperative Association, Inc.
245 North High Street, Columbus 16, Ohio
Representative—Walter N. Callahan

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Division of Ashland Oil & Refining Co. Box G
Freedom, Pennsylvania
Representative—D. A. Smith

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Representative—David F. O'keefe

The Farval Corporation
3249 East 80th St., Cleveland, Ohio
Representative—Lee Witzenburg

The Girdler Company
A Div. of National Cylinder Gas Co. Box 987
Louisville 1, Kentucky
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
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Everett 49, Massachusetts
Representative—G. W. Eldridge

Morehouse-Cowles, Inc.
1152 San Fernando Rd., Los Angeles, Calif.
Representative—George E. Missbach

Continued on page 44

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Representative—D. H. Putney

Struthers Wells Corp.
1003 Pennsylvania Ave. West, Warren, Pa.
Representative—K. G. Timm

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Representative—W. C. Hardesty

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Representative—B. H. Loper

American Potash & Chemical Corp.
99 Park Avenue, New York 16, N. Y.
Representative—W. F. O'Brien

Archer-Daniels-Midland Company
Chemical Products Division
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Representative—Frank C. Haas

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Representative—W. F. Luckenbach

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Representative—Eugene W. Adams

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Representative—Garry B. Curtiss

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Representative—C. F. Williams

Witco Chemical Company
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Representative—S. L. Cosgrove

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Representative—Dr. Morton Fainman

Institut Francais du Petrole
CMrR—Courtel, 4 Place Bir Hackeim
Rueil—Malmaison (S. et Oise) France

Les Laboratoires de Recherches Purfina
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Representative—Richard Bender

Petroleum Educational Institute
9020 Melrose Avenue, Los Angeles 46, Calif.
Representative—G. A. Zamboni

Phoenix Chemical Laboratory, Inc.
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Representative—Mrs. G. A. Krawetz

Products Development Laboratory
1 Market St., West Warwick, Rhode Island
Representative—Alberic T. DiMasi

'New England' Globe Valve

Continued from page 41

all of the desirable features of automatic valve operation in one simplified, powerful, inexpensive unit. Available in ten sizes: ¼" to 3"—Jenkins bronze globe body, three voltages: 24V., 115V. and 230V., and three timing cycles: eight, thirty-two and 139 seconds, this unit is easily adaptable to a great number of applications such as: heating, air-conditioning, processing, safety, convenience, and original equipment.

In spite of its very low cost this unit features: automatic disc compensation, extremely tight shut-off, 150 pounds pressure capacities on most sizes, no mounting restrictions, permanent lubrication, quiet, positive operation without linkage, machine cut, hardened steel gears, only eight moving parts, compact size (operator measures 3⅜" x 3⅜" and remains constant on all ten sizes—entire unit small enough to fit between 16" floor joists).

This unit can be controlled by any positive action single-pole, double-throw switch such as temperature, float, manual, time, program, or pressure actuated switches. Because of a new method of operation these units will not bind or stick, and are guaranteed for one year. The "New England" motorized valve, although very compact and uncomplicated, is heavily constructed to insure long trouble-free life.

New Arolube Catalog On Automotive Lube Equipment

An all-new completely revised 52-page catalog covering the full line of Arolube automotive lubricating equipment is announced by the Aro Equipment corporation, Bryan, Ohio.

This handy reference, catalog No. 22, is particularly easy to use with the help of its well-organized index. This pin-points data on five main product groups: *chassis service*, covering pumps, hose reels, portable cabinets, wall Arolubers, and H.P. service assemblies and accessories; *conventional gear service*, featuring choice of pumps, hose reels, portable cabinets, wall Aroluber, and L.P. service assemblies and accessories; *A.T.F. service*, including pumps, reels, wall Aroluber, and the line cabinet; *motor oil service*, with data on pumps, reels, and the wall Aroluber; *air and water service*, provided by various reels, Roto-Wash car washer, and tire inflation gauge; and *miscellaneous*, ranging through accessories and specialized equipment such as adapters, nozzles, grease fittings, hand trucks, dollies, wheel bearing packers and washers, oilers, filters, gauges, hand and power gun sets, and many other items.

A unique warranty backs the firm's popular AL-207 Air Motor "for three years or 10,000 lube jobs." Full details are given on page one of the catalog.

The catalog concludes with two pages of technical installation data; an explanation of the firm's "loaner pump service" that is available when an Aro pump is out for overhaul; and details about the company's nationwide network of service depots staffed by factory-trained men in all principal cities. A free copy of the new catalog is available on request to Aro.

CONSTANT

SEARCH for BETTER LUBRICANTS by DENCO

ASSURES QUALITY IN YOUR PACKAGE

The same "Know-How" that makes Denco the first in the manufacture of bentone lubricants, is used in everyday production of Denco's complete line of greases, oils, and compounds for every lubricating and metal-working function. A "Know-How" that's backed by fifty years of experience.

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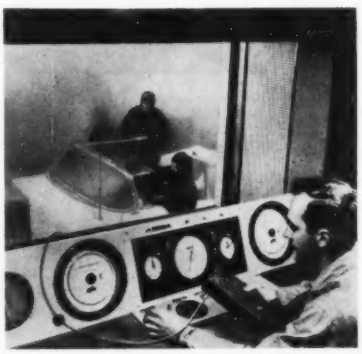
Gulf's Automotive Laboratory Tests Tomorrow's Lubricants



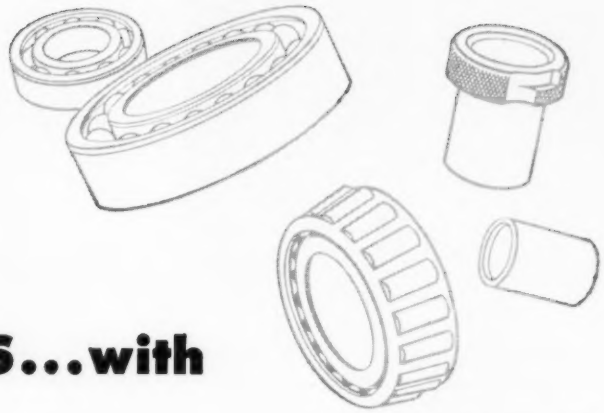
In the Gulf research laboratories fuels and lubricants are tested on the chassis dynamometer through a drive-in refrigerator, which will accommodate the smallest passenger car or the largest trans-continental bus. Both the humidity and temperature can be controlled in this laboratory — the latter to below 70 F.

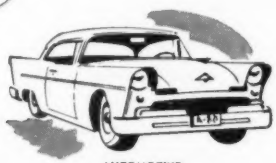
Present day engines are tested for performance, but equally important are the possible future engines which undergo exhaustive testing procedures. Right now, for example, studies are being made on engines equipped with fuel injection systems.

The requirements for fuels and lubricants to satisfy the more powerful and efficient engines increase constantly. Lubricants have to be tough and durable, and they must prevent the formation of harmful deposits.

A research program on combustion processes and the development of fuels and lubricants is continuous at this modern and complete Gulf research center in Harmarville, Pennsylvania.

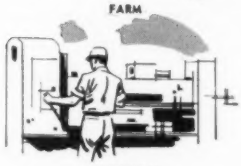
Make more versatile LITHIUM LUBRICANTS...with Hydrofol FATTY ACIDS 200





AUTOMOTIVE

FARM



INDUSTRIAL

Lithium base soap gels made from either Hydrofol Acids 200 or Glycerides 200 provide outstanding lubricant performance at extreme temperature ranges. They inhibit graining and produce lubricants with a fine, hard texture and a high dropping point. Their characteristics make fine greases even finer. They add outstanding water, temperature and shear resistance to the grease.

For more complete information on use of Hydrofol Acids 200 and Glycerides 200 in your grease formulations, write on your letterhead or telephone your ADM Representative.

SPECIFICATIONS

	HYDROFOL FATTY ACIDS 200 (12-Hydroxystearic)	HYDROFOL GLYCERIDES 200 (Hydrogenated Castor Oil)
Melting Point °C		86-88
Titer °C	70-74	70-74
Acid Number	172-182	4 Maximum
Iodine Value	4 Maximum	3 Maximum
Saponification Value	182-187	177-181
Acetyl Value	133 Minimum	138 Minimum
Hydroxyl Value	147 Minimum	155 Minimum

Hydrofol PRODUCTS

Hydrogenated and Distilled Fatty Acids and Stearic Acid ... Hydrogenated Vegetable, Fish, Sperm Oil and Tallow ... Hydrogenated Castor Oil . . . Stearyl, Cetyl, Oleyl Alcohol . . . Sperm Oils and Spermaceti . . . Behenic Acid . . . Erucic Acid . . . Hydroxystearic Acid . . . Olefins . . . Hydrocarbons.

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News About NLGI

HCL Strikes Again

Inflation and rising prices are familiar to all—expenses continue to edge upward and the margin of profit must continually be guarded against creeping costs. In the case of the NLGI SPOKESMAN the reverse is true—the margin of loss must be watched, for this subsidized journal is the victim of inflation which might increase its deficit.

Because the monthly magazine is an important member service, expenses are sustained . . . increased advertising revenues helped stave off any change in subscription rates (which have been the same for over seven years) for some time. Still, the cost spiral has edged upward and rather than increase the burden to members or restrict either quality or quantity, non-member readers are being asked to assume a nominal subscription price, comparable to other technical journals. Beginning August 1, 1957 non-member subscription prices will become $5.00 domestic and $6.00 foreign (member rates will remain in effect . . . $2.50 and $4.00 domestic and foreign, respectively).

In this fashion NLGI will alleviate a cost factor and at the same time maintain a steady flow of technical and marketing information to the industry in this country and throughout the world.

Cleveland Container Joins

The seventh new member to join NLGI since the first of the year has become affiliated with the Institute this month . . . the Cleveland Container company has an Associate Member classification. Mr. R. D. Sayles represents this firm from Chicago offices at 4925 South Halsted street. A feature article on Cleveland Container will be presented in a later issue.

NLGI Representative Changes

Two member firms have made recent changes in the individuals representing them to NLGI . . . they include:

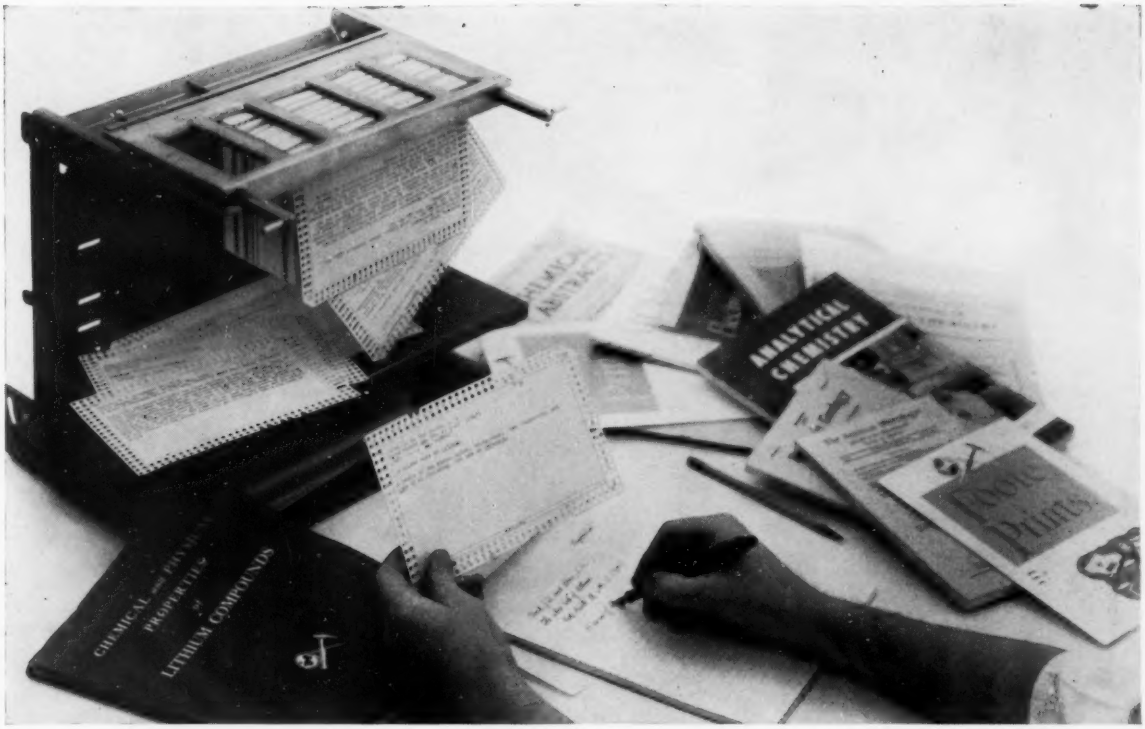
Cities Service Petroleum, Inc., has named Mr. B. H. Rosen of the Cities Service Research and Development company as NLGI Company Representative. Mr. Rosen replaces the late Mr. R. E. Rawlings, in this Active member firm.

Archer-Daniels-Midland company, an Associate member firm, has specified that Mr. Arnold G. Johanson will act as Technical Representative to NLGI.

SERVICE AIDS

Send Orders to: National Lubricating Grease Institute, 4638 Nichols Parkway, Kansas City, Mo.

- **REPRINTS — From the NLGI SPOKESMAN are available at low cost. Page forms are left standing for three months, company imprint or advertising arranged.**
- **VOLUME XX—Bound volume of the NLGI SPOKESMAN from April, 1956 through March, 1957. An excellent reference source, sturdily bound in a handsome green cover . . . $7.00 (NLGI member price) and $10.00 (non-member) plus postage.**
- **NLGI MOVIE—"Grease, the Magic Film," a 16-mm sound movie in color running about 25 minutes, to be released in October, 1957. First print $600, second print $400, third and subsequent orders $200 each (non-members add $100 to each price bracket).**
- **WHEEL BEARING MANUAL—"Recommended Practices for Lubricating Automotive Front Wheel Bearings." More than 90,000 copies of this booklet have been distributed throughout the world. Fifteen cents a copy (NLGI member price) with quantity discounts — company imprint arranged.**
- **BONER'S BOOK—Manufacture and Application of Lubricating Greases, by C. J. Boner. This giant, 982-page book with 23 chapters dealing with every phase of lubricating greases is a must for everyone who uses, manufactures or sells grease lubricants. A great deal of practical value. $18.50, prepaid.**



AT FOOTE the LITHIUM story is 450 feet long

The country's most exhaustive collection of printed material on lithium—its characteristics, compounds, and applications—rests on 450 feet of library shelving at Foote Mineral's Berwyn Research Library. Here is the up-to-the-minute historyof lithium . . . indexed for immediate access to any one of 13,000 references which chemically, physically, and metallurgically describe this most unusual of all metals. Begun more than a quarter century ago when Foote pioneered in the development of lithium, it is still growing at the rate of well over a foot of library shelf a week.

What does this mean to you? Well, lithium and its compounds in a very few years have outgrown the laboratory curiosity stage to become important factors in chemistry . . . ceramics . . . greases . . . organic intermediates . . . nuclear energy . . . to name but a few. Chances are that in the next five years you'll be investigating lithium as it might apply to your field. But when you do . . . before you invest time, effort, and money . . . your ideas will be thoroughly researched in this immense accumulation of data, by men who have played an important part in discovering the facts and creating the literature.

• • •

Write for *Chemical and Physical Properties of Lithium Compounds* and a taste of what Foote's store of lithium information has to offer you. This Data Bulletin is available on request to the Technical Literature Department, Foote Mineral Company, 402 Eighteen West Chelten Building, Philadelphia 44, Pa.

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PLANTS: Cold River, N.H.; Exton, Pa.; Kings Mountain, N.C.; Knoxville, Tenn.; Sunbright, Va.

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The STRATCO contactor

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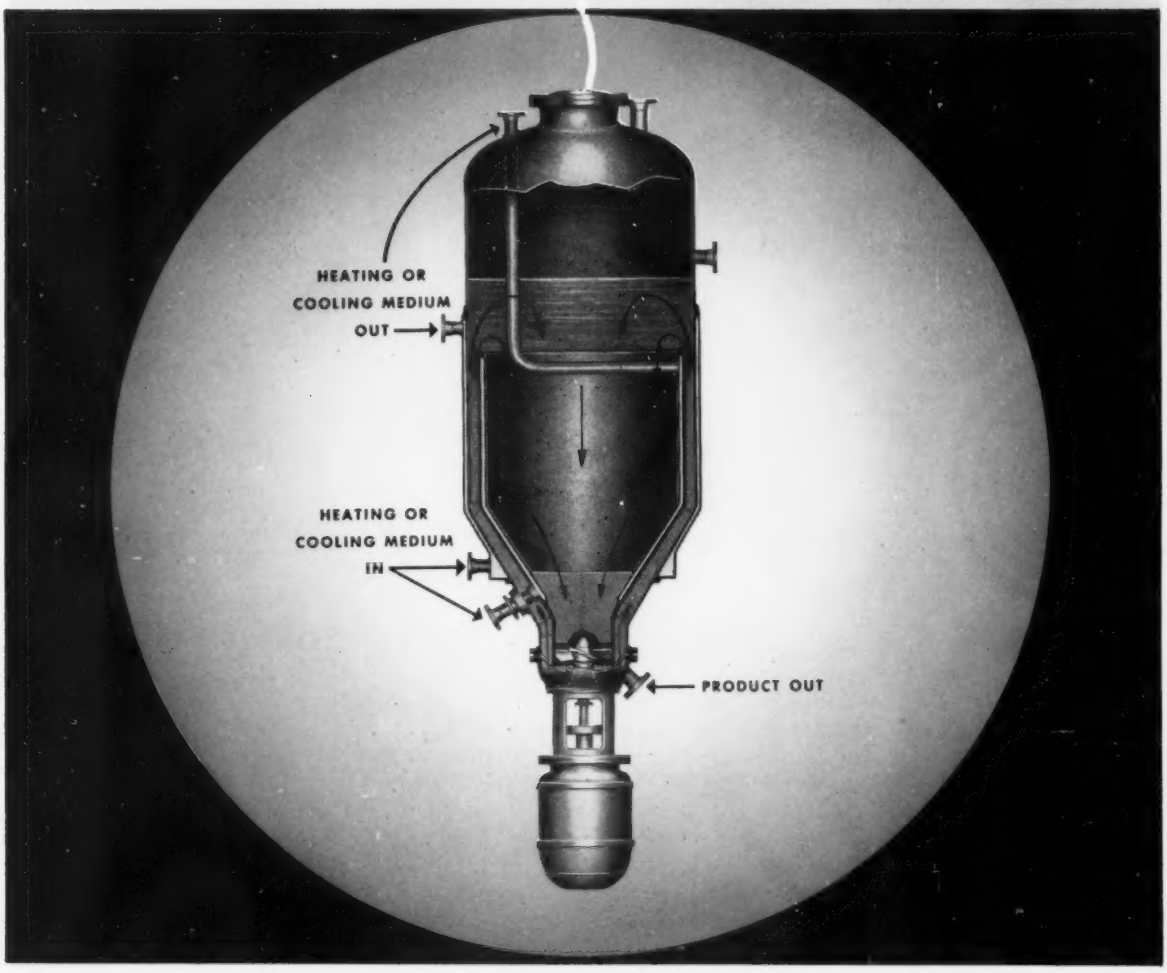

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Adaptable to existing plants to improve quality of product and reduce manufacturing cost. A vital part of all complete grease plant installations.

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